Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US05/000038

International filing date: 03 January 2005 (03.01.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 60/534,321
Filing date: 03 January 2004 (03.01.2004)

Date of receipt at the International Bureau: 09 February 2005 (09.02.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
Organisation Mondiale de la Propriété Intellectuelle (OMPI) - Genève, Suisse

1278707

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

January 27, 2005

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *60/534,321*
FILING DATE: *January 03, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/00038*

Certified by

Jon W. Dudas

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

Atty. Dkt. No. 026032-4654

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Smith et al.

Title: VEHICLE COMPONENT AND METHOD FOR MAKING A VEHICLE COMPONENT

Appl. No.: To be determined

Filing Date: 01/03/2004

Examiner: To be determined

Art Unit: To be determined

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: Commissioner for Patents, PO Box 1450, Alexandria, Virginia 22313-1450.

EL 979077105 US (Express Mail Label Number)

01/03/04 (Date of Deposit)

Scott D. Anderson (Printed Name)

(Signature)

PROVISIONAL PATENT APPLICATION TRANSMITTAL

Mail Stop PROVISIONAL PATENT APPLICATION
Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

Transmitted herewith for filing under 37 C.F.R. § 1.53(c) is the provisional patent application of:

Nels R. Smith
10230 Springwood Drive
Zeeland, MI 49464

Scott A. Hansen
447 Pinewood Court
Holland, MI 49424

Jeffrey T. Stout
2050 Francis Avenue SE
Grand Rapids, MI 49507

Atty. Dkt. No. 026032-4654

Andrew Butz
2916 - 104th Avenue
Zeeland, MI 49464

Bart W. Fox
4654 Majestic Vue
Zeeland, MI 49464

Enclosed are:

[X] Specification and Abstract (23 pages).

[X] Informal drawings (30 sheets, Figures 1-51).

[X] Application Data Sheet (37 CFR 1.76) (5 pages).

The filing fee is calculated below:

		Rate		Fee Totals
Basic Fee		$160.00		$160.00
[ ]	Small Entity Fees Apply (subtract ½ of above):		=	$0.00
	TOTAL FILING FEE:		=	$160.00

[X] Check number 13466 in the amount of $160.00 to cover the filing fee is enclosed.

[X] The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 06-1447. Should no proper payment be enclosed herewith, as by a check being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 06-1447.

Please direct all correspondence to the undersigned attorney or agent at the address indicated below.

Respectfully submitted,

Date 1/3/04

By _____

FOLEY & LARDNER
Customer Number: 26371
Telephone: (414) 297-5740
Facsimile: (414) 297-4900

Scott D. Anderson
Attorney for Applicant
Registration No. 46,521

Attorney Docket No.: 026032-4654

U.S. PROVISIONAL PATENT APPLICATION

for

VEHICLE COMPONENT AND METHOD FOR MAKING A VEHICLE COMPONENT

Provisionally Named Inventors: Nels Smith
Scott A. Hansen
Jeffrey T. Stout
Andrew R. Butz
Bart W. Fox

VEHICLE COMPONENT AND METHOD FOR MAKING A VEHICLE COMPONENT

FIELD

[0001] The present application relates to the field of molded articles having multiple colors and/or made from multiple materials. More specifically, the present invention relates to a molded article with multiple colors (or materials or textures) and integrated soft portions. More specifically, the present inventions further relate to interior panels or structures for vehicles (e.g., automobiles such as cars, trucks, and the like; airplanes, boats, etc.) or other applications that include at least one relatively soft (e.g., padded or cushioned) portion formed by a foamed-in-place (PFIP) process.

BACKGROUND

[0002] It is generally known to provide for a vehicle trim panel comprised of multiple colors or multiple materials by connecting multiple pieces. Such known trim panels are typically joined together into one assembly by conventional methods such as ultrasonically welding, heat staking or mechanical fastening. Another way of producing a multi-colored trim panel is to mask specific regions and paint the desired color.

[0003] However, such multi-piece trim panels have several disadvantages including poor fit and finish due to part and assembly variation.

[0004] Accordingly, it would be advantageous to provide a molded article that is molded with multiple colors, materials, textures, and the like. It would also be advantageous to provide a vehicle trim component (e.g., door panel, pillar, instrument panel, console, etc.) with multiple colors and/or multiple materials. It would further be advantageous to provide a multi-color/multi-material trim panel that is molded as (one-piece) an article that does not need secondary joining operations and is not masked and painted. It would further be advantageous to provide a one-piece, multi-color/ multi-material panel that is aesthetically desirable and creates unique styling opportunities that would not normally be executed due to high cost and

poor fit and finish outcomes associated with traditional methods. It would be desirable to provide for a trim panel having one or more of these or other advantageous features. To provide an inexpensive, reliable, and widely adaptable trim panel that avoids the above-referenced and other problems would represent a significant advance in the art.

[0005] It is also generally known to provide padded or cushioned vehicle interior components. Padded or cushioned vehicle interior components such as panels (e.g., instrument panels, door panels, etc.) conventionally include a substrate made of a relatively rigid material, a relatively soft core (e.g., a foam core), and an outer surface or skin. For example, a vehicle door panel may be cushioned to provide added comfort for an occupant of a vehicle when a portion of the occupant's body interfaces or contacts the door panel. Various methods of providing such cushioning are known in the art, although such known methods do not provide certain advantageous features and/or combination of features. For example, one difficulty in producing panels having cushioned portions is that it may be difficult to optimize the location of the cushioned portions such that the cushioned portions are provided only in areas that are directly interfaced (e.g., contacted) by an individual. Alternatively, certain areas of vehicle interior trim panels are not contacted by passengers such as locations on a door panel proximate the floor of the vehicle. There may be little or no reason to provide cushioned portions of the door panel in such regions. Further, providing cushioned portions or regions in areas where there is no requirement to do so adds unnecessary expense (i.e., material, labor, and equipment) and may also add excess weight to the vehicle.

[0006] To provide localized cushioned portions for interior vehicle components, one known method involves coupling a cushioned component to a rigid component. For example, a relatively rigid panel (e.g., a door panel) may have coupled thereto a component that includes a relatively rigid substrate, a relatively soft skin, and a foam interior portion. One difficulty with such a method is that such method requires the use of additional components (e.g., an additional substrate, bolts or other fastening devices to secure the panel substrate to the substrate of the cushioned portion, etc.), which adds both weight and expense to the finished product.

[0007] Accordingly, there is a need to provide a method for producing components such as panels or other structures for use in vehicles that includes a relatively soft or padded

portion or section. There is also a need to provide components that have regions of localized cushioning that are optimized based on the location likely to be interfaced by a vehicle occupant or other individual. There is also a need to provide a component that has regions of localized cushioning that has a decreased mass and requires less material than conventional components having cushioned regions. There is also a need to provide an integrally formed vehicle component that includes localized regions of cushioning. There is also a need to provide components and a method for making components that may be manufactured in a relatively simple and efficient manner with reduced manufacturing and material costs. There is also a need to provide a manufacturing method for producing components having one or more cushioned portions that utilizes existing equipment.

SUMMARY

[0008] One embodiment of the invention relates to a molded article formed by a multi injection substrate, a skin, and foam injected between the substrate and skin. The process for forming the substrate comprises injecting a first material into a first cavity, moving a retractor member to define a second cavity, and injecting a second material into the second cavity. The first and second materials may be different types of plastic, different colors, textures, or combinations thereof. The first cavity is defined by two mold sections (e.g., a cavity and a core) and the retractor member. The second cavity is also defined by the two mold sections, the retractor member, and the (at least partially) hardened first material. The molded article may be a door trim panel or vehicle instrument panel, or the like. The skin and substrate are placed in a fixture and the foam is injected between the skin and substrate.

[0009] Other embodiments further relates to various features and combinations of features shown and described in the disclosed embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIGURES 1-35 are exemplary schematics for multi-color (or multi-texture, multi-material, etc.) processes according to an exemplary embodiment.

[0011] FIGURE 35 is a perspective schematic view of a component or assembly for use in a vehicle according to an exemplary embodiment.

[0012] FIGURE 36 is another perspective schematic view of the component shown in FIGURE 35.

[0013] FIGURE 37 is a photograph showing a component for use in a vehicle according to another exemplary embodiment.

[0014] FIGURE 38 is a side cutaway schematic view of a component according to another exemplary embodiment.

[0015] FIGURE 39 is a side cutaway schematic view of a portion of the component shown in FIGURE 38.

[0016] FIGURE 40 is a side cutaway schematic view of a component similar to that shown in FIGURE 39 illustrating a component formation operation.

[0017] FIGURE 41 is a side cutaway schematic view of a portion of a component according to another exemplary embodiment.

[0018] FIGURE 42 is a side cutaway schematic view of a component according to another exemplary embodiment illustrating a component formation operation.

[0019] FIGURE 43 shows side cutaway schematic views of a skin and a substrate for a component according to another exemplary embodiment.

[0020] FIGURE 44 is a perspective schematic wire frame view showing the coupling of the skin and substrate shown in FIGURE 43.

[0021] FIGURE 45 is a perspective schematic view of a door panel having areas of cushioning according to an exemplary embodiment.

[0022] FIGURES 46-51 are perspective views of an instrument panel and door, according to a preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED AND EXEMPLARY EMBODIMENTS

[0023] Referring to FIG. 1, a molded article (shown in FIGS. 1 and 2 as a door trim panel 10) is shown according to an exemplary embodiment. The trim panel 10 is manufactured (molded) from a process that allows for multiple colors and/or multiple materials to be allocated (positioned, located, molded, placed, etc.) at different portions of the trim panel. According to an exemplary embodiment, the process for making such a molded article includes multiple injections into a mold that is reconfigured during the molding operation, as further described below.

[0024] The advantages for this type of trim panel include the ability to localize and strategically place multiple colors and/or use of more premium materials that yield soft touch, low gloss, impact resistance, UV protection, high heat performance, or the like. For example, it is desirable to have soft touch or UV resistant additives on only the upper portion of a door panel or IP. Another advantage of this type of trim panel is the improvement of fit and finish because it is one-piece (as opposed to mechanically-joined multiple pieces) and produced in the same process.

[0025] There are many styling opportunities that can be realized with a multi-shot trim panel when compared to a conventional multiple-piece trim panel. The two-color color boundary may run (e.g., transition, pass, etc.) through an opening or another component. Isolated color break-ups that make a feature look separate may be realized in the one-piece trim panel such as a different color molded-in speaker grille or map pocket border. Multi-color pillar trim may be provided to allow flow-through from the interior's front to rear without having to break the trim into multiple pieces. Accents in scuff plates and other trim may be produced in the same piece. Part separation does not have to dictate color break-up location. Specific details and features can be highlighted in a different color.

[0026] The method uses a multi-shot molding techniques (i.e. two-shot molding, spin molding, transfer molding, over molding, or the like) to produce a one-piece, multi-color/multi-material trim panel. The mold includes a core, a cavity, and a retractor. The first shot of plastic material (representative of a first portion 12 of trim panel 10) is constrained within the mold

corresponding to a particular region on the trim panel by a retractor or slider mechanism. The retractor, core, and cavity provide a first cavity. Once the first cavity is filled with plastic, the retractor is displaced (preferably by approximately the thickness of the part). According to a preferred embodiment, the retractor is displaced to provide a second cavity (defined by the displaced retractor, cavity, core, and the first material). The second shot (representative of a second portion 14 of trim panel 10) then fills the second cavity and plastic flows to and bonds with the first material boundary. According to an exemplary embodiment, the second shot is provided by a secondary injection unit. The retractor provides the shut-off for the plastic by contacting the opposite side of the mold. According to a preferred embodiment, the first material is at least partially solidified when the second material is injected.

[0027] The surface on the retractor that contacts the opposite side of the mold can be perpendicular to or at an angle relative to the direction of the die (mold, tool, etc.) draw. According to an exemplary embodiment (shown in FIGS. 4, 12, and 13), the perpendicular retractor surface is configured to provide a "square" recess (e.g., ditch, indent, etc.) at the two-shot boundary.

[0028] According to another exemplary embodiment (shown in FIGS. 5-9), an angled shut-off (shown as surface 28 of a retractor 30) is configured to provide an angled recess 36 that is intended to allow the two-shot boundary to be hidden from the occupant's sight for most in-car positions. This angled shut-off 28 creates an apparent geometric gap or transition that may be more desired (for some molded articles) than a square, mechanical recess because it can hide the material joint.

[0029] Referring to FIGS. 10-12, to improve the strength of the two-shot boundary, an interlocking geometry can be created to provide a mechanical lock in addition to the chemical bond that exists. According to a preferred embodiment, the molded article includes interlocking geometries and an angled shut-off.

[0030] The shut-off surface on the retractor (either perpendicular to or at an angle to die draw) is designed to withstand molding pressures and prevent injected plastic from flowing into other areas of the tool. FIGS. 4-9 illustrate exemplary cross sections of square and angled two-shot boundary recesses or ditches that could be applied to a molded article (such as a trim panel, instrument panel, etc.). For example, trim panel 10 includes a first portion comprising a

first color and a second portion comprising a second color. Portions of the trim panel is manufactured using a mold that is reconfigured during the molding operation during a process with shut-off stages so that plastic resin of different colors is injected into the mold at different times.

[0031] FIG. 3 illustrates another exemplary molded article (shown as a portion of an instrument panel 16). The instrument panel 16 includes an upper portion 18 molded with a first color and a lower portion 20 molded with a second color.

[0032] FIG. 4 shows a fragmentary sectional view of a mold during a molding operation for an instrument panel. According to an exemplary embodiment, the mold includes a cavity 22, a core 24, and a slide or retractor 26. Preferably, the retractor 26 is at least partially disposed in the core 24. Preferably, the "A" surface (or "show surface") of the molded article is provided by the cavity 22 and the "B" surface is provided by core 24. According to alternative embodiments, the retractor is disposed in the cavity and/or the "A" surface is provided by the core.

[0033] According to an exemplary embodiment, the retractor 26 is configured to move between a first position and a second position (shown in broken lines) during the molding operation. (According to alternative embodiments, the retractor is configured to move to three or more positions (e.g., a third position, etc.) during the molding operation.) The slide or retractor 26 may be moved using any number of methods, including a spring-loaded and wedge system (so that when the mold sections open, the slide moves back into one of the mold sections), by hydraulics, pneumatics, mechanically, or the like.

[0034] The mold shown in FIG. 4 includes a vent 28 between the retractor 26 and the cavity 22. According to an alternative embodiment, the retractor may be designed to "shut-off" against the cavity (i.e., no vent). According to yet another alternative embodiment, the lower portion 20 of the molded article (instrument panel) may be molded first (e.g., by rotating the retractor around, for the geometry shown).

[0035] FIGURES 5-6 illustrate movement of a retractor 30 to provide for the first cavity and then the second cavity during the molding operation. Referring to FIG. 5, for the first shot 30 (shown in red), the retractor 30 closes-off on the cavity-half of the mold to prevent the first

shot from entering into upper portion of tool (shown as the second cavity). The first shot is injected into the first cavity.

[0036] Referring to FIG. 6, for the second shot 34 (shown in blue), the retractor 30 is pulled back to open the upper portion of the tool and provide the second cavity. Preferably, the retractor 30 moves approximately a wall-stock thickness. The second shot is injected and stops flowing when it reaches the first material. FIG. 6 illustrates the finished part.

[0037] Referring to FIGS. 8 and 9, examples of shut-off geometries are illustrated. The shut-off geometry allows the intersection or interface of the two materials (injections or "shots") to be hidden from view. According to an exemplary embodiment, the shut-off geometry provides for a recess 36 that has outer surfaces that are angled relative to the major surface of the molded part. According to a preferred embodiment, the recess 36 is angled so that interface of the two materials is hidden (e.g., at least partially, substantially, etc.) from the line of site of the vehicle occupants. According to an exemplary embodiment, the angled recess geometry is provided by an angled shut-off surface. Referring to FIG. 9, an arrow 38 illustrates the direction of the draw of the retractor and the mold die.

[0038] FIG. 12 is a fragmentary side section view of the mold configured to provide a molded article with a mechanical interlock 40. According to an exemplary embodiment, the mechanical interlock 40 is provided by one or more (or a series of) projections and/or recesses on the retractor. FIG. 10 illustrates a section of a square mechanical interlock 42 wherein the projections and/or recesses on the retractor have a square cross-section. FIG. 11 illustrates a section of a dovetail mechanical interlock 44 wherein the projections and/or recesses on the retractor have angled sides (e.g., to provide additional interlock, directional stability). The first shot 46 is shown in blue and the second shot 48 is shown in yellow. As such, the locking direction is vertical.

[0039] FIG. 13 is a side section view of a vehicle instrument panel 50 with a square recess 52 separating an upper portion 54 and a lower portion. The lower portion of the instrument panel 50 includes a glove box section 56 (which defines the rear wall of a glove box) and an outboard section 58 (which typically provides a generally flush surface with the glove box door (not shown)). According to an exemplary embodiment, the upper portion 54 of the

instrument panel 50 is molded first and then the lower portion of the instrument panel 50 is molded.

[0040] FIGS. 14-20 illustrate a retractor concept for allowing vertical walls (parallel to die draw) to be full material thickness according to an exemplary embodiment.

[0041] FIGS. 21-28 illustrate a retractor system for allowing vertical walls (parallel to die draw) to be full material thickness (e.g., for use in forming at corners). FIGS. 21 and 22 are a horizontal section of the mold having a core 60, a cavity 62, a first retractor 64, a second retractor 66 and a secondary slide 68. (Secondary slide 68 is configured to provide molded in detail for this particular molded article (i.e., recesses to receive an end cap for an instrument panel)). FIGS. 23-28 are vertical section views of the mold and the molded article (as it is molded). FIGS. 23, 25, and 27 are vertical sections of the mold when the first portion (blue) of the molded article is injected with a first material. FIGS. 24, 26, and 28 are vertical sections of the mold when the second portion (yellow) of the molded article is injected with a second material. As shown, use of the second retractor 66 is used to provide additional wall thickness.

[0042] FIGS. 29 and 30 illustrate a retractor system for allowing vertical walls (parallel to die draw) to be full material thickness. A mold for a molded article includes a first retractor or slide 70 and a second retractor or slide 72. The first slide 70 moves generally perpendicular relative to the major portion of the molded article. The second slide 72 moves generally angular (diagonal) relative to the major portion of the molded article. The molded article includes a first portion 74 made from the first injection (or "shot") and a second portion 76 made from the second injection (or "shot"). The mold shown in FIGS. 29 and 30 is different than the mold shown in FIGS. 21 and 22 in that the core portion between the first slide 70 and the second slide 72 has been eliminated and the two slides are shaped so that the movement of the two slides 70, 72 provide for the cavity space to receive the plastic resin injections.

[0043] FIGS. 31-34 illustrate alternative styling embodiments using the disclosed method. For example, FIG. 32 illustrates several colors in one part, such as two-tone door look and separately-colored sail panels. Separate parts (e.g., soft-skinned area) can bridge two colors without fit issues. Also, isolated color break-ups (e.g., molded-in speaker griller made to look separate, and map pocket surround) may be used.

[0044] FIG. 33 illustrates part separation requirements that need not dictate color break-up location, which would be useful on quarter trim and B-pillar trim of a vehicle. Smaller details that would create fit or masking problems could also be achieved. Small details like cargo hooks or tie-down hook highlights can be molded-in.

[0045] FIGURES 35 and 36 illustrate one exemplary embodiment of a component or assembly such as a panel or other structure for use in a vehicle (e.g., automobiles such as cars, trucks, buses, and the like; airplanes, boats, etc.). Such components may be provided in a wide variety of sizes, shapes, and configurations according to various exemplary embodiments. For example, such components may be utilized in an interior passenger compartment of a vehicle, and may find utility in the form of door panels, dashboards, instrument panels, consoles, sidewall trim, overhead liners, or other vehicle components or portions thereof. FIGURE 45 shows one exemplary embodiment of a door panel.

[0046] The vehicle component is provided with one or more localized or discrete areas of softness or cushioning in areas that are interfaced by a passenger or other individual. For example, a door panel such as that shown in FIGURE 45 may be provided with cushioning in areas where a portion of a passenger's body are likely to contact the door (e.g., on the armrest, adjacent the window sill, etc.) without the need to provide cushioning in the entire door (e.g., see FIGURE 45 in which regions of hard plastic are shown in areas not typically contacted by a passenger). In this manner, the areas of cushioning may be optimized based on the typical passenger experience. One advantageous feature of such method is that materials and manufacturing costs may be reduced, and the relatively inefficient practice of providing cushioning in areas that are not generally contacted by a passenger (e.g., beneath the armrest, etc.) may be eliminated.

[0047] The methods of providing localized regions of softness or cushioning in a manner described herein may be utilized to provide components having a wide variety of configurations. For example, a door panel may be provided that includes one or more islands of hard plastic (e.g., bezels, accents, appliqués, pull cups, etc.). In another example, complex geometries (e.g., ball armrests, x,y,z boundaries, etc.) may be formed. In yet another example, the door panel may include proud (e.g., raised) or recessed regions of cushioning for enhanced aesthetics.

[0048] According to an exemplary embodiment, the component includes a member or element in the form of a relatively rigid substrate, base, or stratum (referred to herein as a "substrate" for simplicity). A cushioned or padded portion is provided adjacent or proximate to at least a portion of the substrate, and includes a skin and a filler material provided intermediate or between the skin and the substrate. It should be noted that according to various exemplary embodiments, all or a part of the substrate may have a cushioned or padded portion provided adjacent thereto. For example, according to an exemplary embodiment, a skin is applied adjacent a substrate, and portions of the skin may be in direct contact with the substrate, while other portions of the skin may be separated from the substrate by a filler material. In this manner, localized regions of cushioning may be provided while retaining the look and feel of the skin even in those regions not provided with cushioning.

[0049] The substrate may be made of any suitable material, including any of a variety of metals (e.g., aluminum, magnesium, metal alloys, etc.) or polymers (e.g., polypropylene, polyethylene, copolymers, etc.). The substrate may be formed in any of a wide variety of shapes, sizes, and configurations (see, e.g., a photograph provided as FIGURE 37, in which the substrate has a relatively square shape with rounded corners, and FIGURE 45, which shows a door panel according to an exemplary embodiment having regions of localized cushioning), and may include a variety of other features not shown in FIGURES 35 and 36 (e.g., apertures for door locks and handles, molded-in designs, etc.). The substrate may be a stand-alone component or may be a component in a larger assembly (e.g., the substrate may be an entire door panel or may be a portion thereof, etc.).

[0050] According to an exemplary embodiment, the relatively cushioned or padded member or element is provided above or over at least a portion of the substrate. The skin forms at least a portion of the exterior surface (e.g., the portion visible from a passenger compartment, which is typically be referred to as the "A" surface, etc.) of the component. According to an exemplary embodiment, a portion of the substrate forms a portion of the exterior surface. A boundary between the substrate and the skin may be provided (e.g,. in the form of a seam or joint). Such boundary may be visible at the exterior surface or may be filled in with a material to provide a "seamless" look for the component.

[0051] According to an exemplary embodiment, the skin is made of a relatively soft or flexible material comprising a polymeric material (e.g., polyurethane, polyvinylchloride (PVC), a thermoplastic olefin (TPO), etc.). According to other exemplary embodiments, the skin may be made of other materials, including textiles such as cloth, leather, composite materials, layered materials (e.g., a layer of leather applied above a polymeric material layer), etc.

[0052] According to a preferred embodiment, the skin is provided on the substrate in such a manner that a space or void is formed intermediate or between at least a portion of the skin and the substrate. According to one exemplary embodiment, substantially all of the skin away from the boundary between the substrate and skin is separated from the substrate by a space or void (e.g., to form a cavity). According to an alternative embodiment, portions of the skin may be provided in direct contact with the substrate, such that one or more spaces or voids are provided between the skin and the substrate in one or more particular regions. The particular design chosen may depend on any of a variety of factors, including the desired look and feel of the outer surface of the panel, materials costs, ease of manufacturing, etc.

[0053] A material (e.g., a filler material) is provided or introduced into the space or cavity to act as a filler. It is intended that such material acts as a relatively soft or cushioning material to provide the cushioned member with at least a portion of its relatively soft or cushioned characteristic. According to a preferred embodiment, the material is a polymeric material such as a foam material (e.g., a urethane foam). The filler material is provided into the cavity in liquid form and is subsequently expanded to fill the cavity. For example, where a foam material is provided as a filler material, the foam reacts to expand and form a cellular structure within the cavity.

[0054] According to a preferred embodiment, the skin is manufactured or produced utilizing a slush molding process. In a slush molding process, a thermoplastic material in a liquid or powdered form is introduced into a temperature-controlled mold to form a viscous skin adjacent to the mold walls. Once the skin is formed, the excess material is removed from the mold and the skin is allowed to cure and cool, after which the skin is removed from the mold. One advantage of utilizing a slush molding process is that it is relatively inexpensive and efficient in producing relatively complex skin geometries.

[0055] According to an alternative embodiment, the skin is manufactured or produced utilizing a vacuum forming process. In a vacuum molding process, a pre-cut or formed sheet of polymeric material is provided in a mold and heated to soften the material. A vacuum is applied to the mold, which draws the softened polymeric material toward the walls of the mold. The polymeric material then cools and maintains the shape defined by the mold walls.

[0056] According to other alternative embodiments, the skin may be manufactured according to various other methods. For example, the skin may be formed in an injection molding process, an extrusion process, a casting process (e.g., gravity casting), or any other suitable process for forming a polymeric skin.

[0057] According to an exemplary embodiment in which the skin is made of a polymeric material, the skin has a thickness of between approximately 0.5 and 3.0 millimeters, and most preferably between approximately 1.0 and 1.5 millimeters.

[0058] The skin may have a size, shape, and configuration that is adapted or configured to features included in the substrate. In one example, the substrate may include a cutout or depression, and the skin may be provided within the cutout (see, e.g., see FIGURE 37). In another example, the skin may be applied over a protrusion formed in the substrate (see, e.g., FIGURE 38). The size, shape, and configuration of the skin and substrate may have any number of forms, and relatively complex geometries may be formed. For example, the skin may be provided over a substrate in the form of a door panel such that the skin wraps around an edge (e.g., a rear edge) of the panel. One of skill in the art will appreciate that various possibilities exist in this regard.

[0059] As shown in FIGURE 35, a visual boundary (e.g., a seam or joint) is formed or provided between the skin and the substrate, such that the substrate forms a frame around the skin. The size, shape, and configuration of the boundary may vary in various exemplary embodiments. The boundary may also be eliminated or reduced in size using a material to at least partially fill in the boundary (e.g., a caulk, adhesive, liquid polymer, or other materials). According to other embodiments, the skin may be provided in such a manner that no visual boundary exists (e.g., the skin is provided over all portions of the substrate such that no boundary is visible on the exterior surface of the component).

[0060] The skin and/or the substrate may include features configured to couple at least a portion of the skin to the substrate. The coupling may be accomplished by way of a mechanical interconnection (e.g., a friction or interference fit) or by other mechanisms. According to an exemplary embodiment, the skin is coupled to the substrate in a manner that provides a relatively airtight and/or watertight seal between the skin and the substrate.

[0061] FIGURES 38 and 39 illustrate one exemplary embodiment showing the coupling between the skin and the substrate (FIGURE 39 shows an enlarged portion of FIGURE 38 showing the point of coupling in greater detail). A protrusion or extension (shown, for example, as a generally U-shaped portion of the skin) extends from the skin into an opening (e.g., a channel, groove, recess, notch, etc.) provided or formed in the substrate. The size, shape, and configuration of the protrusion and the opening may be provided such that the protrusion and opening mate when they are brought together (e.g., the protrusion includes a relatively rounded or curved portion that has a radius similar to a radius provided for a relatively rounded or curved portion of the opening, as shown in FIGURES 43-44). The protrusion may include a flange or extension that extends therefrom to provide enhanced fitment between the skin and the substrate.

[0062] Any of a variety of configurations may be utilized for the protrusion and opening, several nonexclusive examples of which are shown in the accompanying FIGURES. The protrusion may be formed on the skin by forming a portion of the skin in the mold (e.g., to provide an edge of the skin with a "folded back" configuration to form a protrusion) or by forming the protrusion after the skin is removed from the mold. The protrusion may be integral to the skin or may be produced separately and secured thereto by an adhesive or other fastener. The position of the protrusion and the opening may be reversed, such that an opening is formed in at least a portion of the skin and one or more protrusions are formed in the substrate, such that the protrusion(s) of the substrate may be inserted into the opening(s) formed in the skin to produce a mechanical seal between the skin and substrate.

[0063] One or both of the protrusion and the walls or surfaces of the opening may be relatively flexible and/or resilient such that insertion of the protrusion into the opening causes one or both of the protrusion and the walls or surface of the opening to bend or flex. Upon

insertion of the protrusion into the opening, the flexible and/or resilient component may return to its pre-insertion state to couple the skin to the substrate.

[0064] According to a preferred embodiment, the skin and substrate are coupled together such that a relatively airtight and/or watertight seal is provided. In one example, the skin includes a protrusion that extends substantially entirely about the periphery of the skin and the substrate includes an opening such as a channel or groove that extends substantially entirely about the periphery of the area over which the skin is provided. The protrusion is pressed or positioned into the opening to form a seal about substantially the entire periphery of the skin to form a seal. According to an exemplary embodiment, one or both of the protrusion may extend only partially about their periphery to provide local sealing of the skin to the substrate (e.g., the skin may include a plurality of protrusions that are provided intermittently about the periphery of the skin). Various sizes, shapes, and configurations may be used for the protrusion and the opening to couple the skin to the substrate.

[0065] According to another embodiment, the skin includes one or more features (e.g., protrusions) that are drawn into an opening such as a groove, channel, or other structure provided in the substrate by way of a vacuum or other pressure or force. For example, the skin may include one or more protrusions that extend at least a portion of the way about the periphery of the skin, and the protrusions may be inserted into an opening provided in the substrate. In such an embodiment, the skin is held in place by application of a vacuum that removes the air between the protrusions and the walls of the opening. In this manner, a relatively airtight and/or watertight seal may be formed between the skin and the substrate. FIGURE 40 shows one exemplary embodiment in which an aperture is formed or provided in the substrate; a vacuum may be drawn through an aperture formed in a groove formed in the substrate to secure the skin to the substrate. A vacuum box may be used to draw the vacuum, and may have a size sufficient to allow for overflow of filler material into the vacuum box during manufacturing (see, e.g., FIGURE 42).

[0066] In contrast to the embodiment shown in FIGURE 40, one or more apertures provided in the substrate for allowing the use of a vacuum may be provided in other locations in the substrate (i.e., instead of directly proximate or adjacent to a protrusion provided on the skin). For example, FIGURE 41 illustrates an exemplary embodiment in which the aperture is provided

adjacent or proximate to the boundary between the skin and the substrate. In such an embodiment, a locator or push button is provided to provide a place for an individual to press the protrusion into the channel. According to another exemplary embodiment shown in FIGURE 42, an aperture is provided away from the boundary (e.g., on the side of the protrusion opposite that of the boundary).

[0067] According to yet another exemplary embodiment, both mechanical fastening features (e.g., interference fit protrusion(s) and opening(s)) and vacuum coupling features may be provided. According to this embodiment, the skin includes one or more protrusions that fit into one or more openings to mechanically secure the skin to the substrate, and the substrate also includes one or more apertures to allow suction by a vacuum to secure the skin to the substrate. In any of the exemplary embodiments illustrated in FIGURES 40-42 (or in other exemplary embodiments), the protrusion may provide a mechanical coupling in addition to the seal provided by the use of a vacuum or may act only as a guide to provide proper location of the skin onto the substrate.

[0068] FIGURE 40 illustrates one exemplary embodiment of a mechanism for introducing material into the space or cavity formed between the skin and the substrate. According to this embodiment, two apertures are provided in the substrate for allowing vacuum suction. A vacuum is created to secure the skin to the substrate (e.g., by utilizing vacuum boxes to draw the vacuum and secure the skin to the substrate in the areas of the apertures). Mechanical coupling between the protrusions and openings may also be utilized to secure the skin to the substrate.

[0069] Once the skin is secured to the substrate by vacuum and/or mechanical means, foam or other filler material is introduced into the cavity through a fill tube or nozzle (e.g., by injection or gravity pouring). The fill tube is coupled to an opening or aperture formed in a portion of the substrate to allow introduction of the material into the cavity. Because the skin is coupled to the substrate in a relatively airtight and/or watertight manner (e.g., by way of the vacuum and/or mechanical coupling mechanisms), foam does not escape into the vacuum box through the apertures. While the embodiment shown in FIGURE 40 illustrates a fill tube that has an interior surface that engages an exterior surface of walls of an opening provided in the substrate, such an arrangement may be reversed such that a portion of the fill tube is inserted

into an opening in the substrate. Various other configurations for the engagement between the substrate and the fill tube may also be utilized according to various exemplary embodiments.

[0070] The numbers, size, shape, and configuration of apertures for allowing vacuum suction and for coupling to the fill tube may vary according to alternative embodiments. For example, more than one fill tube may be coupled to the substrate in various locations, and more than one aperture may be provided for coupling to such fill tubes. The various features of the apertures may be optimized according to various considerations, including manufacturability, cost, and other considerations.

[0071] According to a preferred embodiment, the skin is coupled to the substrate in a manner that does not require the use of a vacuum (e.g., a mechanical interlock or coupling between a portion of the skin and a portion of the substrate). In such an embodiment, the vacuum boxes (FIGURE 40) may be omitted, with the mechanical coupling providing an airtight and/or watertight seal between the skin and the substrate. The mechanical coupling is intended to couple the skin to the substrate in a manner that does not allow foam or other filler material to escape.

[0072] According to an exemplary embodiment, a method of producing a component having one or more cushioned regions includes inserting or providing a substrate or a portion thereof in a mold or other tooling such as a foam-in-place (FIP) tool having a clamshell configuration. One preferred tool is a composite/aluminum tool manufactured by EPW, Inc. of Elkhart, Indiana. The substrate is provided in the mold such that the "A" side or exterior surface portion faces outward (i.e., the rear portion of the substrate is in contact with the mold walls).

[0073] The skin (e.g., a slush molded or vacuum molded polymeric skin) is coupled to the substrate in one or more locations via mechanical and/or vacuum means. For example, the skin may be coupled to the substrate by inserting protrusions formed on the skin into openings such as channels or grooves formed in the substrate to mechanically couple the skin to the substrate. According to various embodiments, a vacuum may be drawn to secure the skin to the substrate in addition to or in place of the mechanical coupling (e.g., utilizing one or more vacuum apertures formed in the substrate).

[0074] Once the skin is secured to the substrate, the mold or tooling is closed. Foam or another filler material is introduced in one or more cavities formed between or intermediate

the skin and the substrate to provide a relatively soft or cushioning material. One or more fill tubes or other devices are coupled to an aperture formed in the substrate that provides an entry point into the one or more cavities provided between the skin and substrate. One or more vent holes may also be provided in the substrate to reduce the amount of carbon dioxide or other gas accumulating within the component during the filling operation.

[0075] The component comprising the skin, substrate, and foam is then removed from the mold or tooling. The skin is coupled to the substrate both by mechanical means (e.g., protrusion and opening coupling) and by the interaction between the filler material and the skin and substrate. For example, a bond may be formed between the skin and foam provided in a cavity. According to an alternative embodiment, an adhesive may be provided on one or both of the substrate and the skin on the interior of the cavity to bond the foam thereto.

[0076] Various process steps may also be utilized in addition to or in place of those described above. For example, it may be necessary to seal or close one or more apertures provided in the substrate subsequent to the filling operation (e.g., to prevent foam or filler material from escaping). In another example, the mold may be rotated after inserting the skin and substrate into the mold and closing the mold prior to filling the cavity or cavities with filler material.

[0077] Referring to FIGURES 46-50, an instrument panel and door are shown according to a preferred and exemplary embodiments, which show the integration of a two color application in a single tool injection molded substrate (FIGURES 1-34) with the addition of partial foam in place soft skin (FIGURES 35-45). Integration of the two color in a single tool injection molded substrate with partial foam in place soft skin in intended to reduce manufacturing costs, and increase flexibility (e.g., design and manufacturing) and craftsmanship (e.g., less "fitted" components, fasteners, additional manufacturing steps that may reduce quality).

Traditional methods of trim manufacture would require multiple tools to create the separate hard colors for the substrate and a separate tools to create the foam and skin of the bolster and the door upper. Once these pieces are created, there would be an assembly process for joining of the four separate substrates requiring additional capitol, labor, and manufacturing footprint. The disclosed invention combines all of these into one injection molded

tool and a secondary foam in place operation. The first color is injected into the tool, and then the second color is then be injected into the tool and would join to the first color. The part then exits the molding machine to be secured in a foam in place fixture. The upper skin and the bolster skin is placed into a fixture and the two-color door is placed on top. Foam is injected behind both skins sealing the parts together and creating a soft compliant buffer between the molded substrate and skins. This new methodology vastly reduces the molding, capitol, and assembly costs for trim manufacture. The process is flexible in that the skins can be wide variety of materials, colors, and textures. Also, the colors of the injection molded substrate can also be varied without change to the tool. Further, this process eliminates assembly of various components that can lead to unsightly gaps, buzz squeak and rattle, and other craftsmanship issues.

[0078] The process of integrating the two color in one tool injection molded substrate with the addition of partial foam and place soft skin begins with molding of a first color or material, then pulling of the retractor, and molding of the second color or material. The mold then opens and the two color or material substrate is removed. The substrate is then placed in a foaming tool or fixture. The skin is then placed in the foaming tool or fixture. The skin may be any of a variety of materials as discussed previously (including polyvinyl chloride (PVC), thermoplastic polyurethane (TPU), reaction injection molded (RIM), etc. According to a preferred embodiment, the two color substrate is injection molded. The process of foaming the skin may be any of a variety of processes discussed previously such as slush molding, PVC injection molding, injection molding of thermoplastic olefin (TPO), RIM skin molding, and the like. According to an exemplary embodiment, the skin is placed in the fixture and held in place by any of a variety of means (e.g., vacuum, clamps, fasteners, pins, friction, and the like.) The multi-color or material substrate is placed in the foaming fixture with the A surface facing downward. The nozzle that injects the foam material is then inserted into a hole in the substrate and foam is injected into a void between the skin and the substrate. According to a preferred embodiment, the integrated multi-color or material substrate and foam in place part is removed from the fixture as a finished component with the skin providing areas (e.g., portions, islands, etc.) of softness. The amount of softness provided by such areas may be varied depending on the materials used for the skin, the amount of foam injected into the void, the size of the void between the skin and the substrate, and the like.

[0079] The material injected behind the laminate can also be translucent in nature, allowing for LED or conventional lamps (or any of a variety of light sources) to be located or attached to the rear of the panel to backlight the exposed rim of material (see FIGURE 51).

[0080] The construction and arrangement of the elements of the vehicle component as shown in the preferred and other exemplary embodiments is illustrative only. Although only a few embodiments of the present inventions have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited herein (e.g., the color of the skin may differ from that of the substrate or may be substantially the same color as the substrate). For example, elements shown as integrally formed may be constructed of multiple parts or elements (e.g., protrusions extending from the skin to couple the skin to the substrate may be integrally formed with the skin or produced separately and coupled or adhered to the skin), the position of elements may be reversed or otherwise varied (e.g., protrusions may be provided in the substrate to engage an opening such as a channel or groove formed in the skin), and the nature or number of discrete elements or positions may be altered or varied (e.g., the number of apertures provided in the substrate for receiving a filler material may differ according to any of a number of considerations). Also, different "materials" used in the disclosed method may be different colors of the same plastic resin, configured to provide different textures; and the like. Also, different materials may be different plastic resins of the same or different color. Also, the disclosed process may be used on any of a variety of molded plastic articles, including vehicle components. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, including any of a wide variety of moldable plastic materials (such as high-impact plastic) in any of a wide variety of colors, textures and combinations. Components such as those shown herein may be used in non-vehicle applications as well, including but not limited to furniture such as chairs, desks, benches, and other furniture items. Other substitutions, modifications, changes and omissions may be made in the design, operating conditions and arrangement of

the preferred and other exemplary embodiments without departing from the scope of the present inventions.

ABSTRACT

A molded article with multi-material or color and soft portions and a method of making the same is disclosed. The molded article comprises a substrate (with multiple injections or shots (e.g., colors, materials, textures, etc.), a skin, and foam injected between the substrate and skin. The substrate is formed by a process wherein a first material is injected into a first cavity, a retractor member is moved to define a second cavity, and a second material is injected into the second cavity. The first and second materials may be different types of plastic, different colors, or combinations thereof. The first cavity is defined by two mold sections (e.g., a cavity and a core) and the retractor member. The second cavity is also defined by the two mold sections, the retractor member, and the (at least partially) hardened first material. The foam in place method of providing soft portion comprises placing the skin in a fixture, placing the substrate in the fixture to form a cavity between the skin and substrate, and injecting foam into the cavity

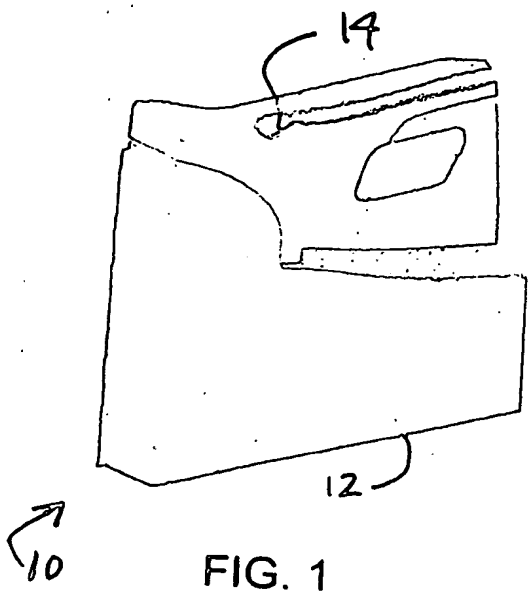


FIG. 1

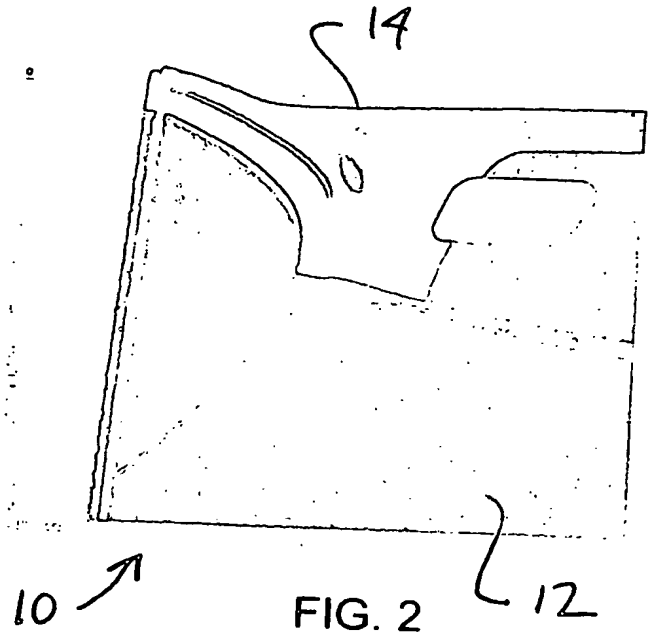


FIG. 2

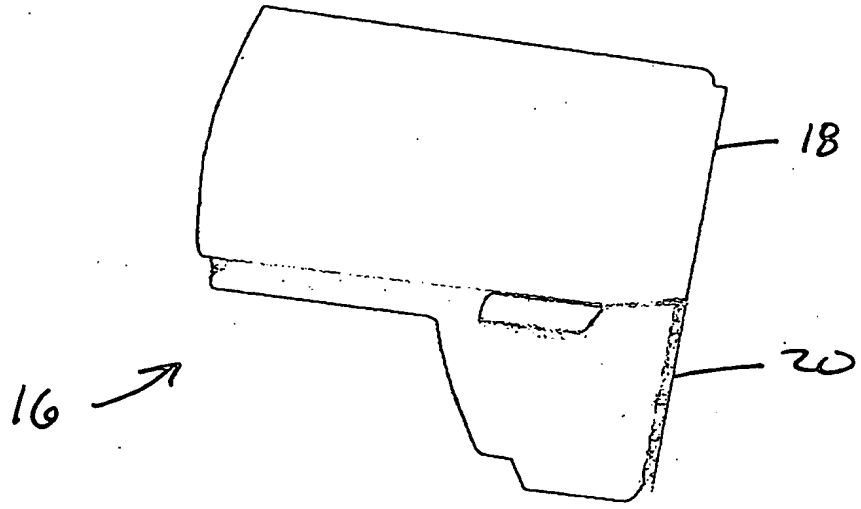


FIG. 3

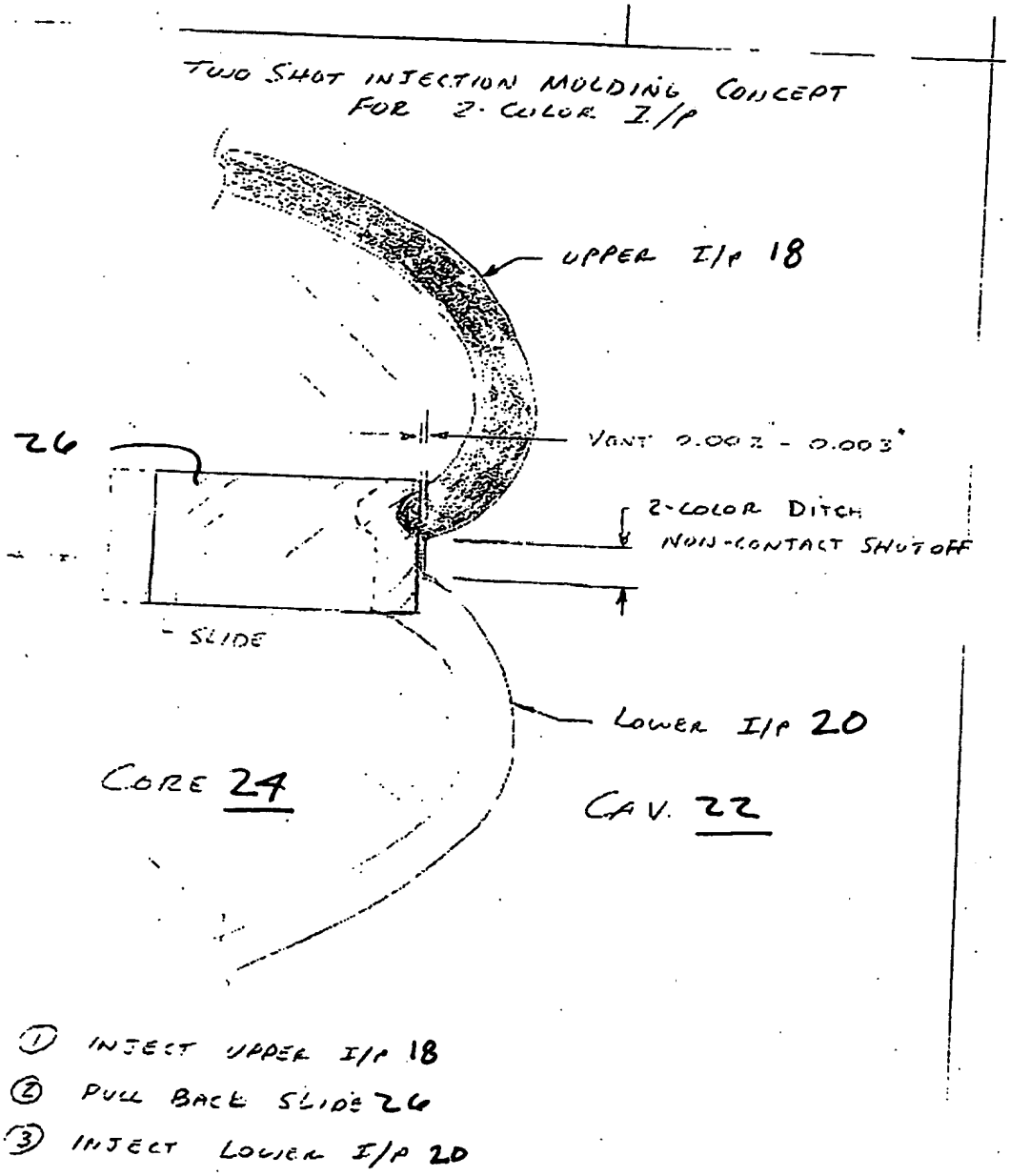
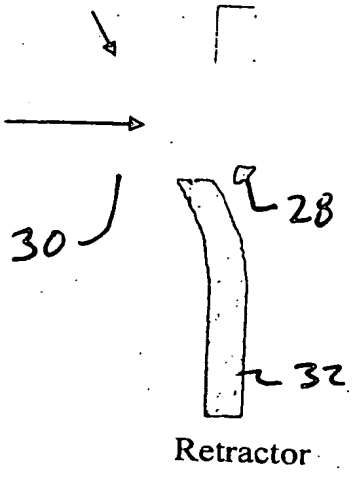

TWO SHOT INJECTION MOLDING CONCEPT
FOR 2-COLOR I/P
UPPER I/P 18
26
VENT 0.002" - 0.003"
2-COLOR DITCH
NON-CONTACT SHUTOFF
SLIDE
LOWER I/P 20
CORE 24
CAV. 22
① INJECT UPPER I/P 18
② PULL BACK SLIDE 26
③ INJECT LOWER I/P 20

FIG. 4

FIG. 5

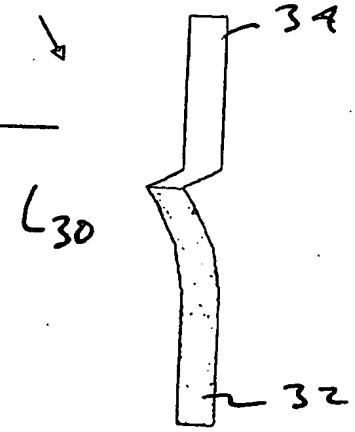


Retractor

First Shot

Retractor closes-off on the cavity half of the mold to prevent first shot from entering into upper portion of tool

FIG. 6

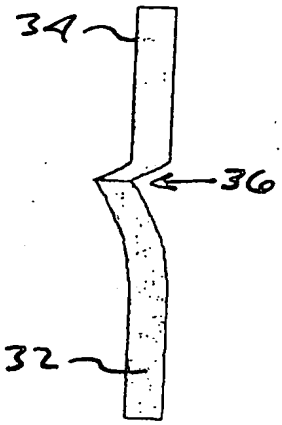


Retractor

Second Shot

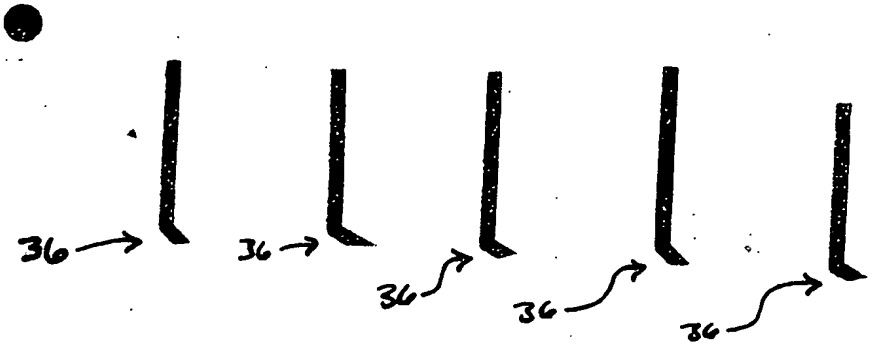
Retractor is pulled back wall stock thickness to open the upper portion of the tool. The second shot is injected and the stops flowing when it reaches the first material

FIG. 7



Finished Part

Molding Sequence



Examples of angled shut-off geometries. These allow the color intersection to be hidden from view

FIG. 8

Examples of angled shut-off geometries. These allow the color intersection to be hidden from view

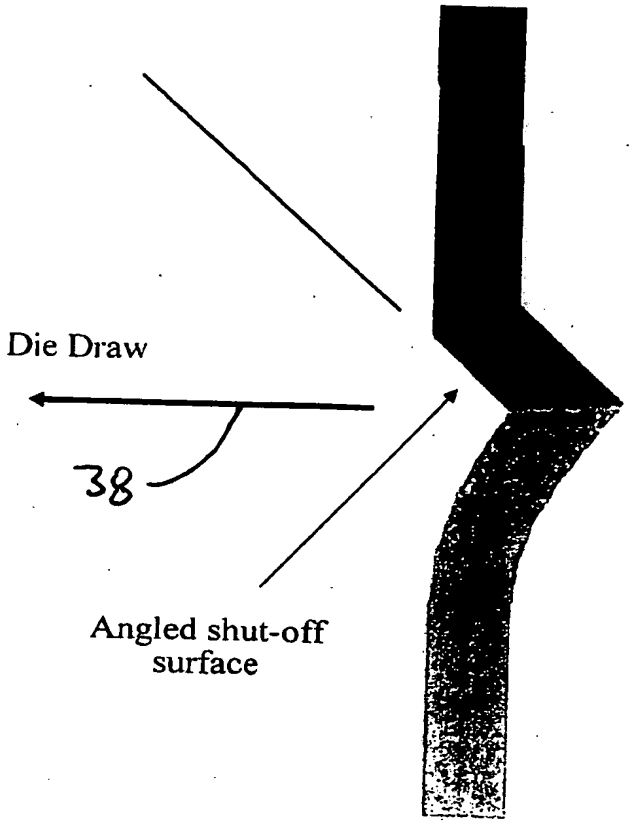


FIG. 9

2-color injection molded joint concept

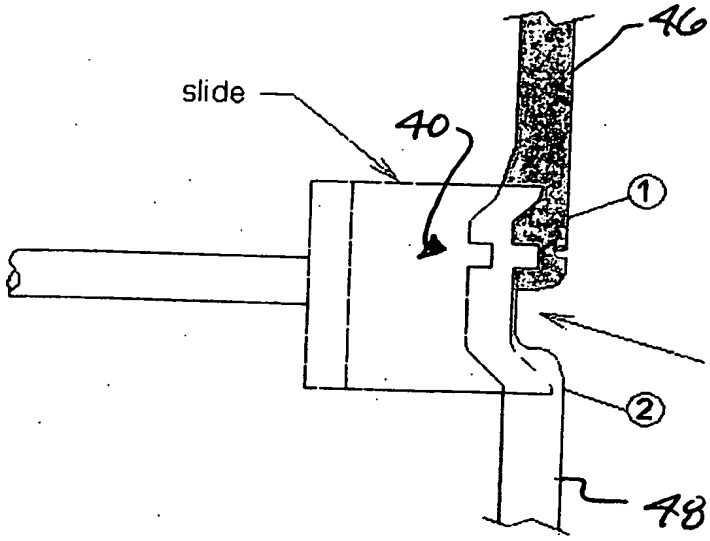


FIG. 12

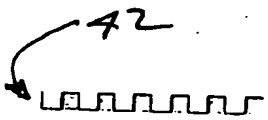


FIG. 10

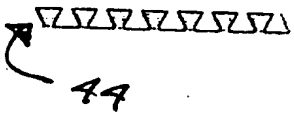


FIG. 11

2-color Injection molded IP
Concept

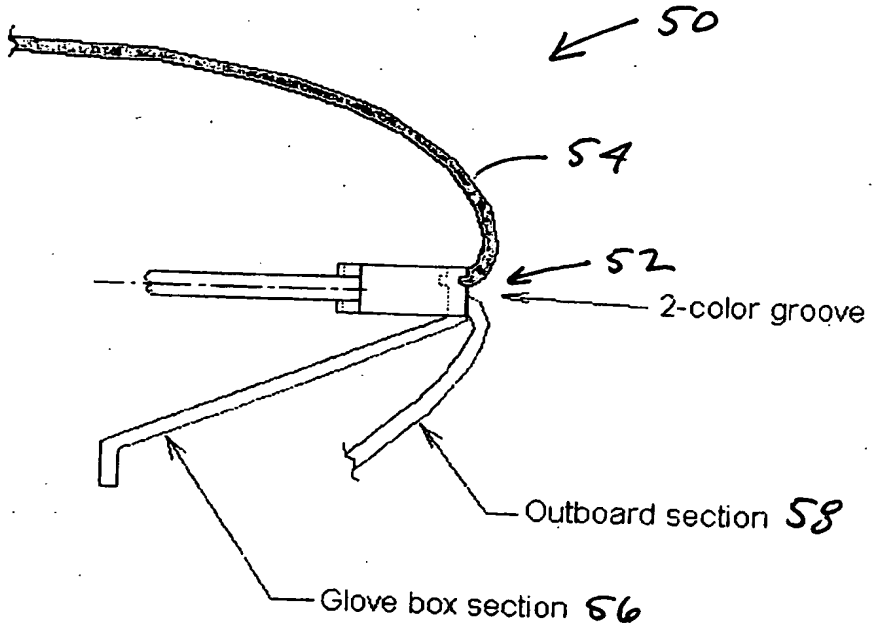


FIG. 13

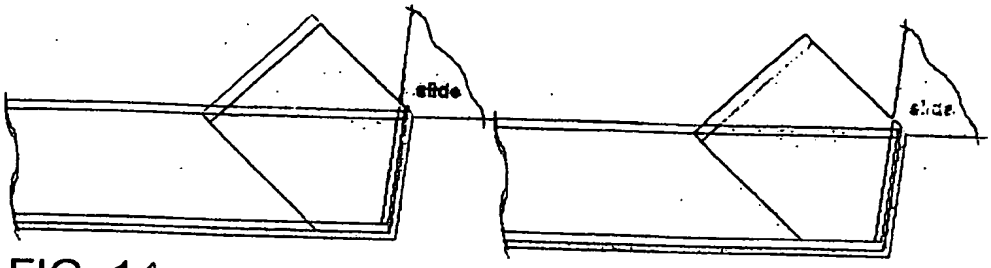


FIG. 14

FIG. 15

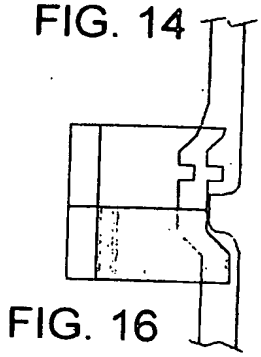


FIG. 16

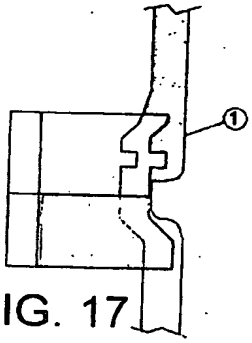


FIG. 17

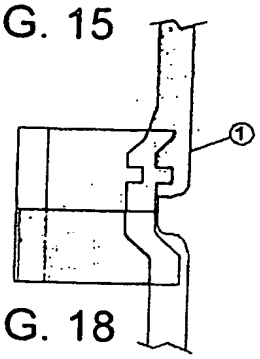


FIG. 18

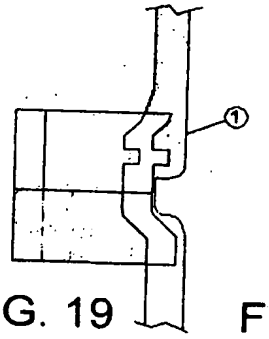


FIG. 19

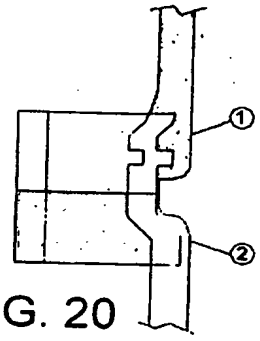


FIG. 20

Retractor concept for allowing vertical walls (parallel to die draw) to be full material thickness

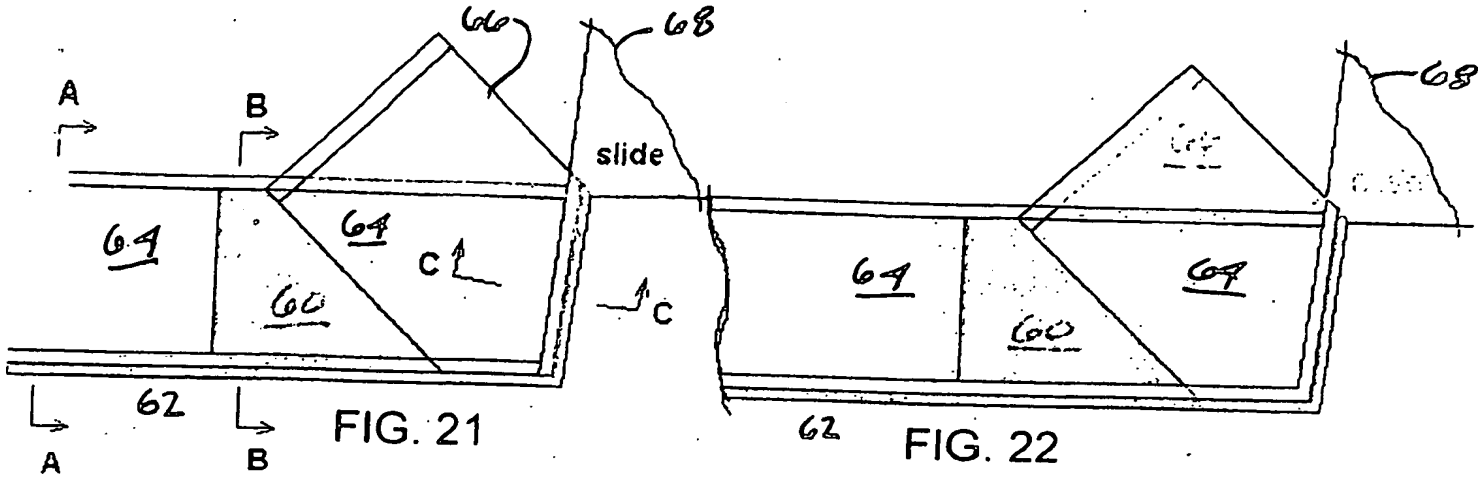


FIG. 21

FIG. 22

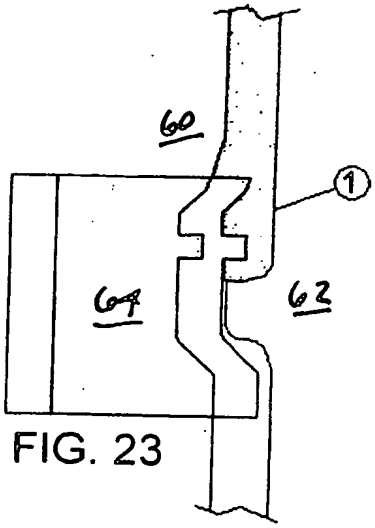


FIG. 23

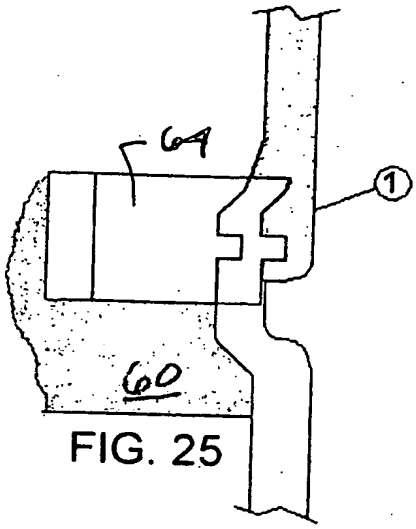


FIG. 25

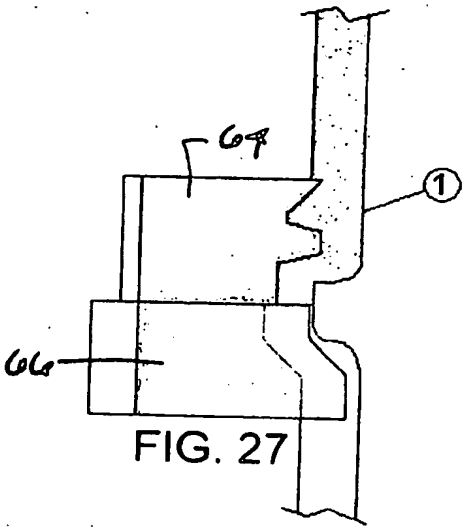


FIG. 27

Section A-A

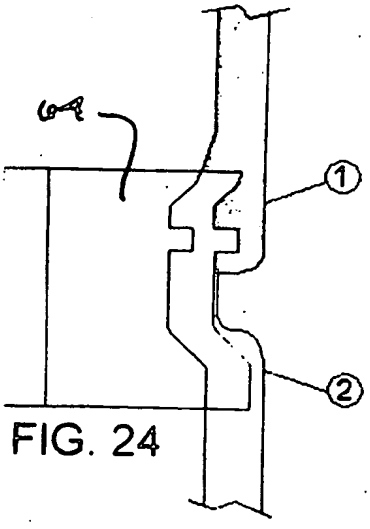


FIG. 24

Section B-B

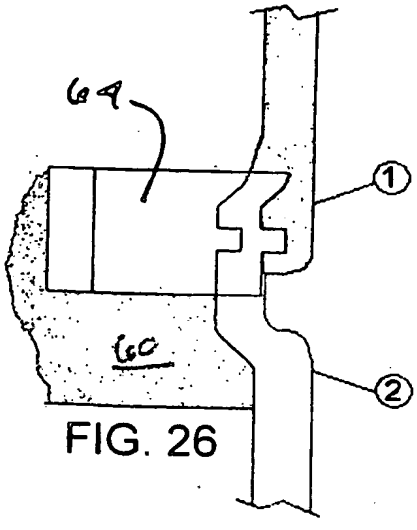


FIG. 26

Section C-C

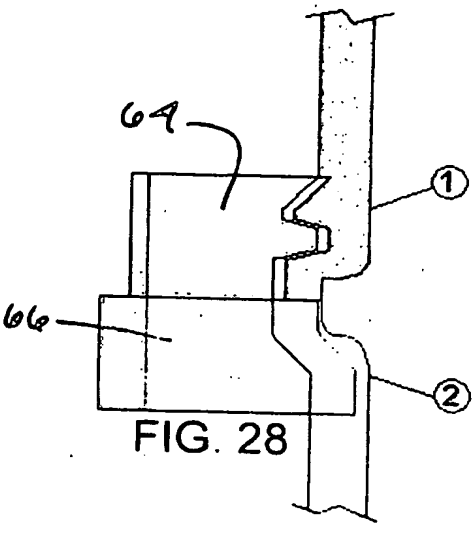


FIG. 28

FIG. 29

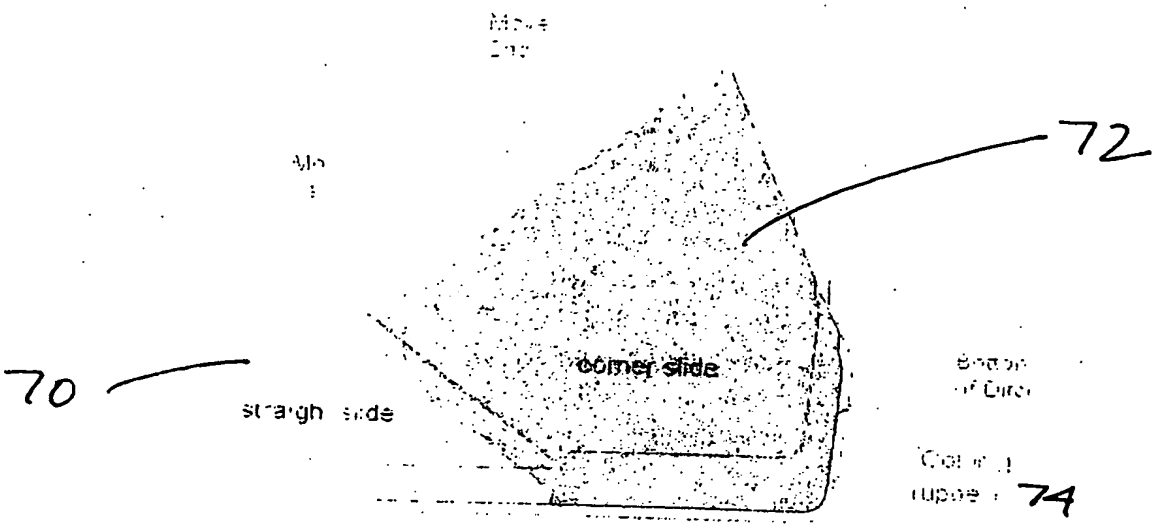
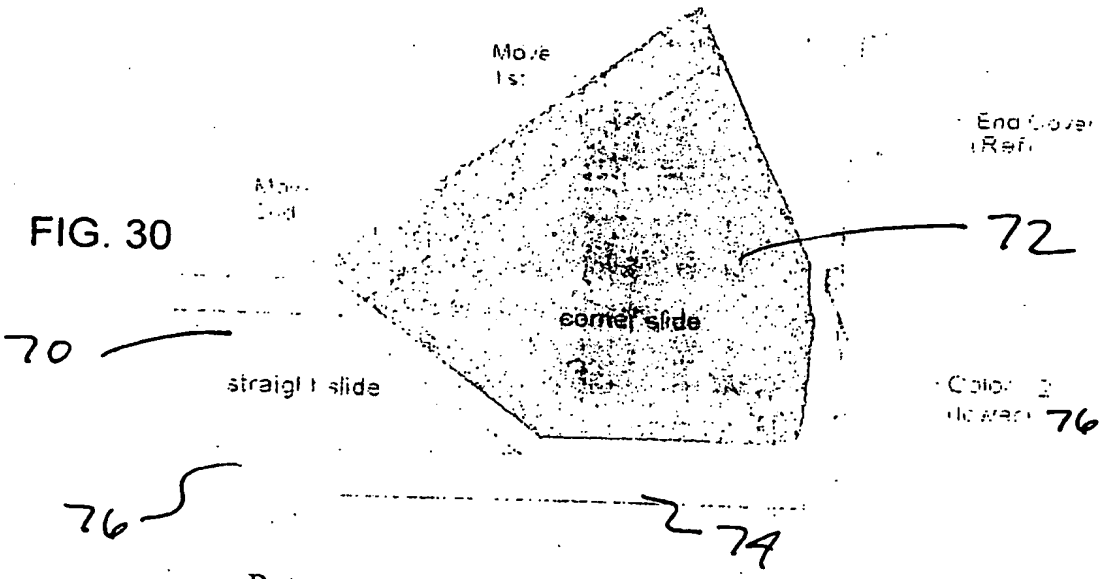
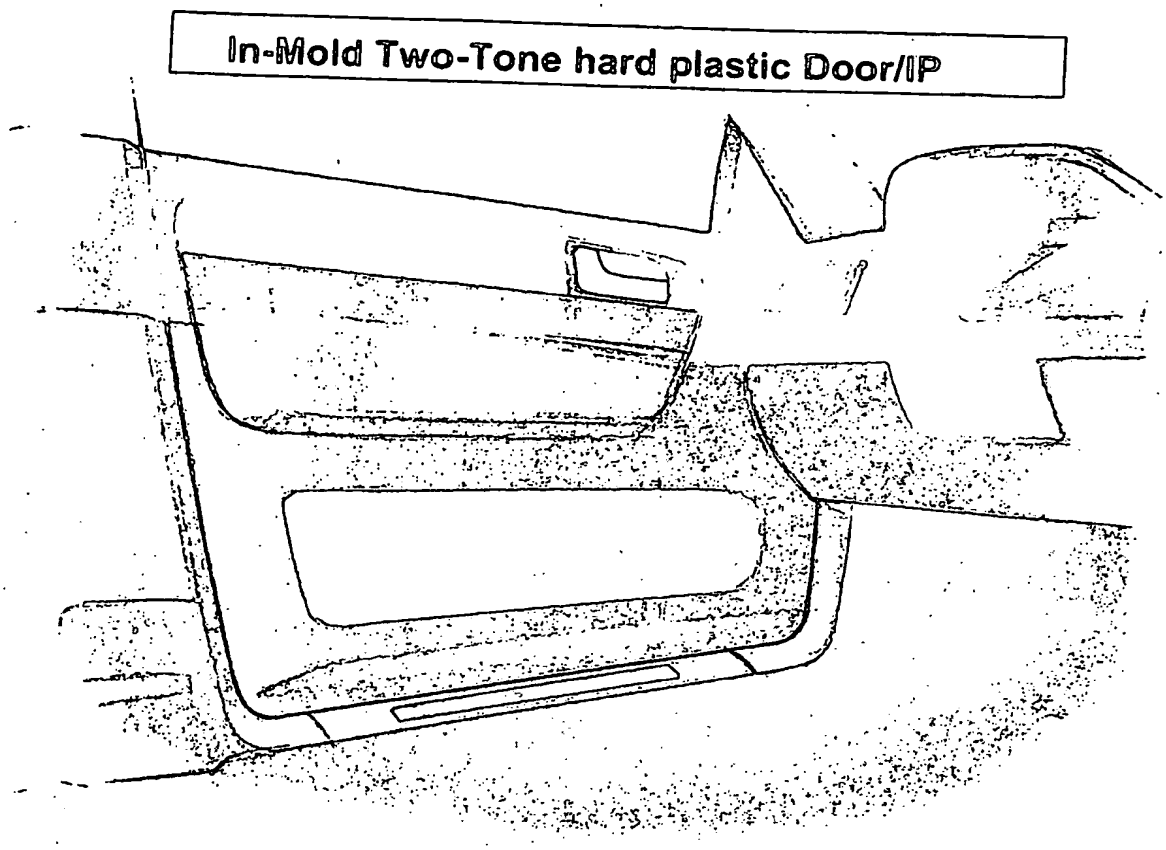


FIG. 30

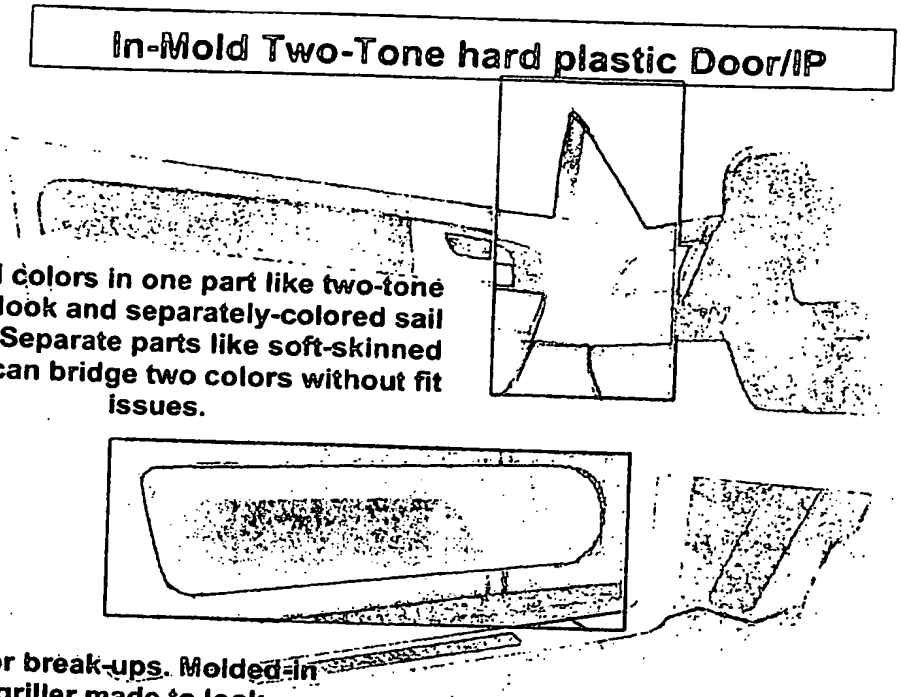


Retractor concept for allowing vertical walls (parallel to die draw) to be full material thickness



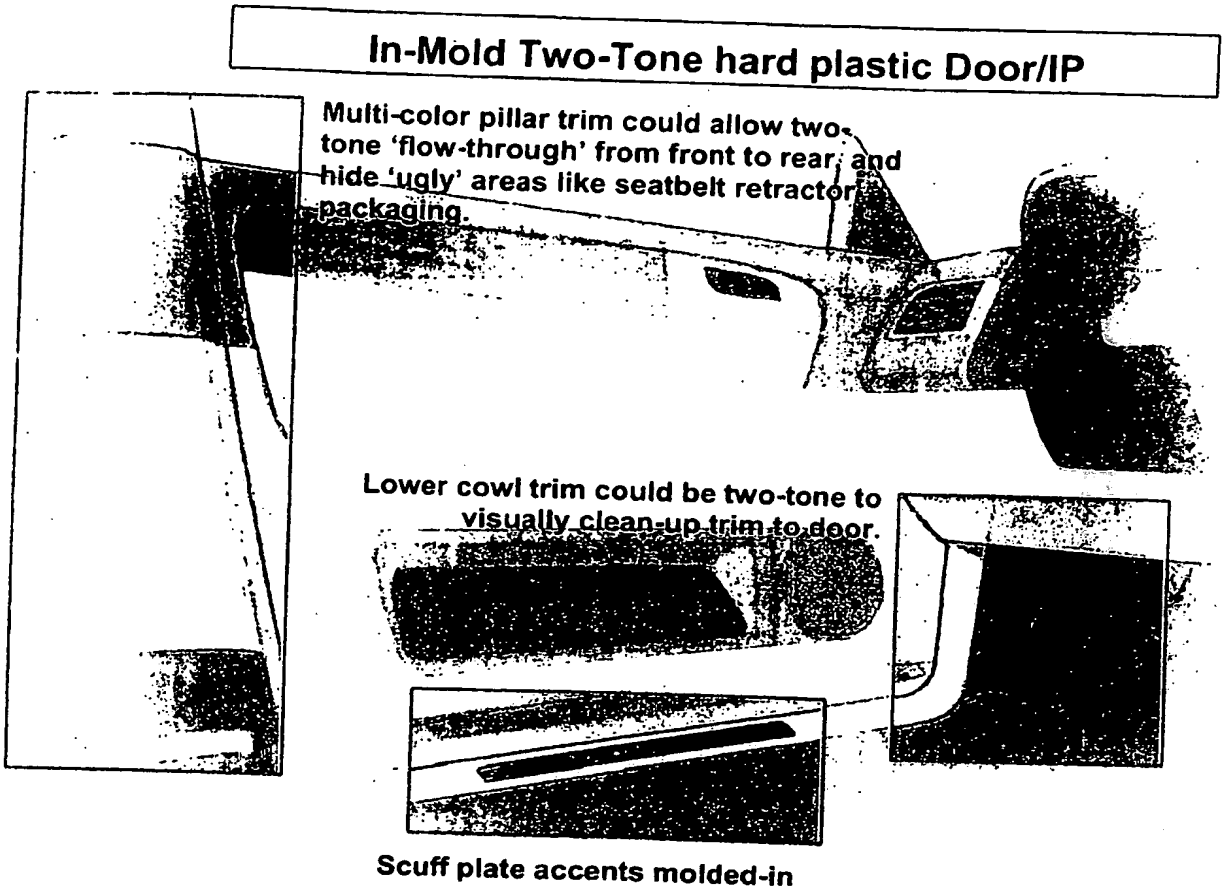
Styling Opportunities

FIG. 31



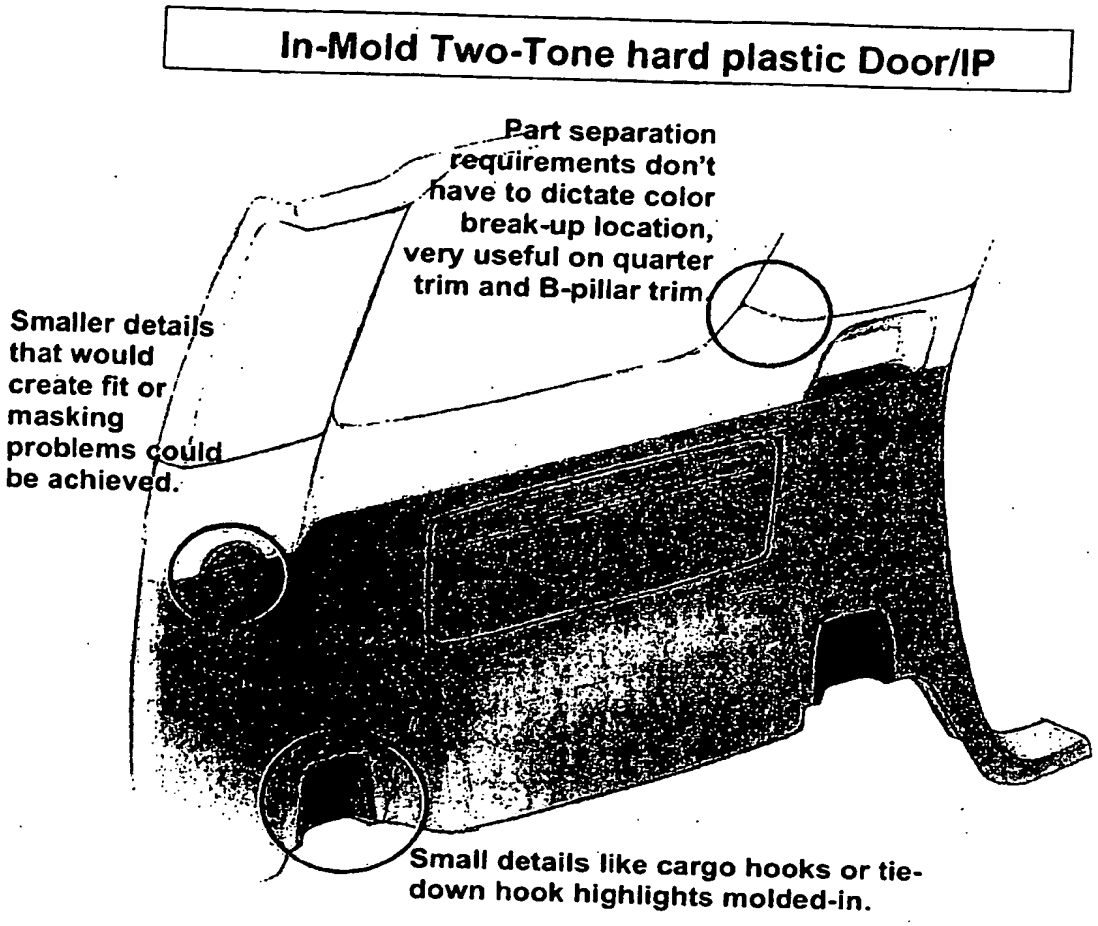
Styling Opportunities

FIG. 32



Styling Opportunities

FIG. 33



Styling Opportunities

FIG. 34

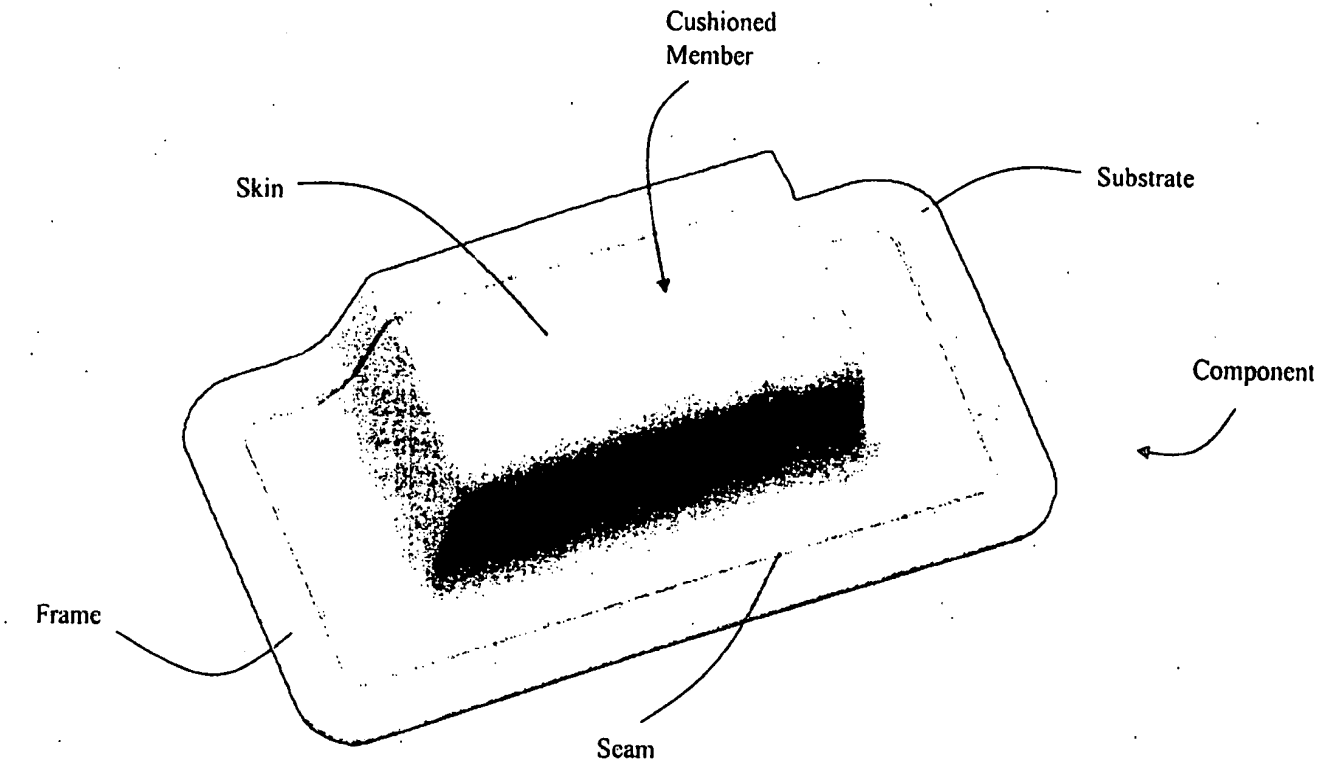


FIGURE 35

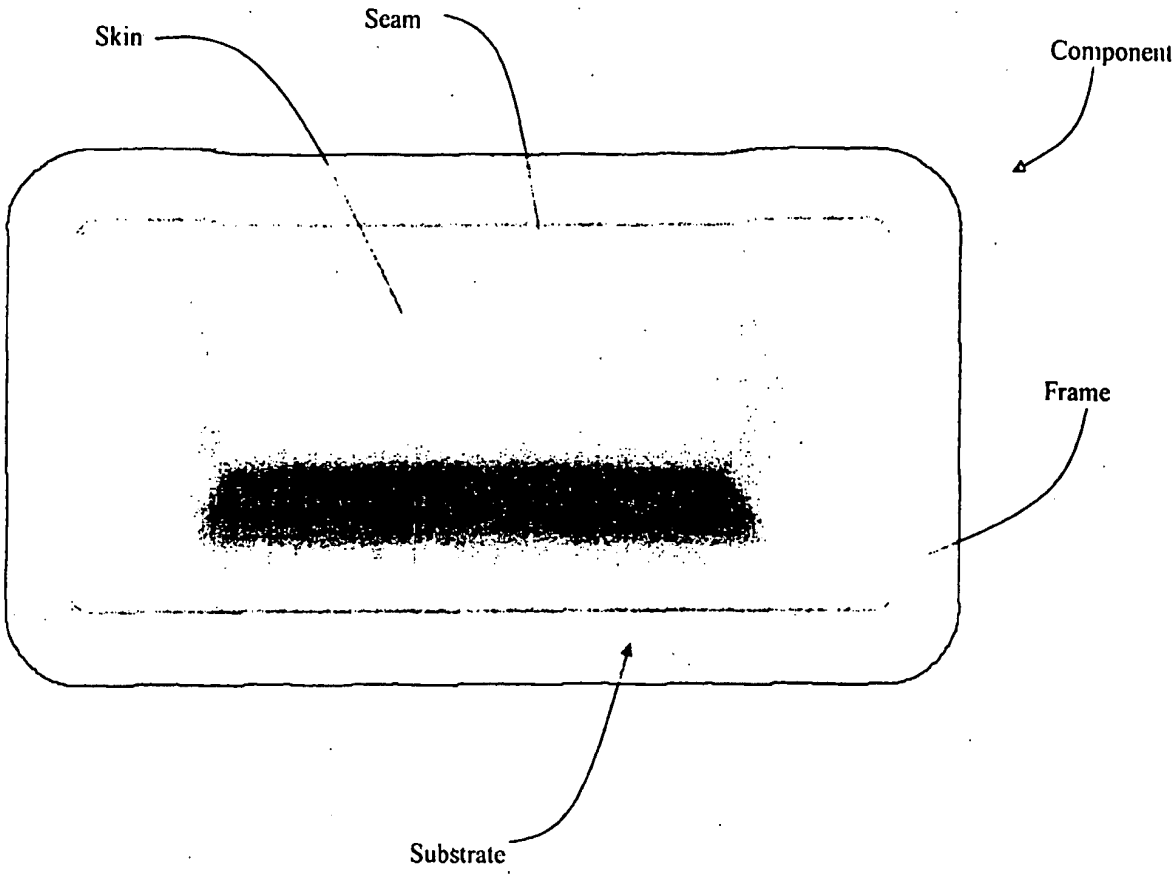


FIGURE 36

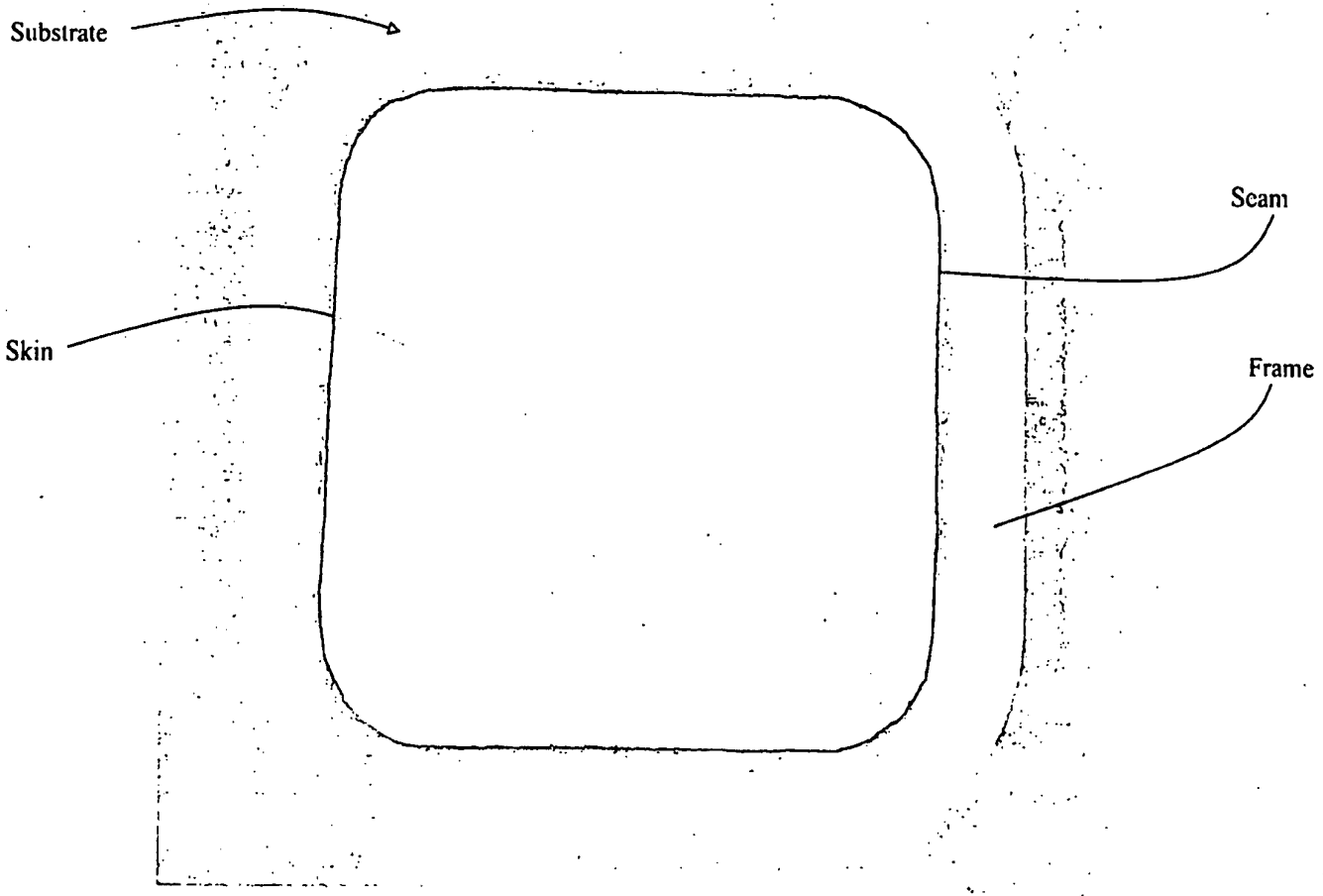


FIGURE 37

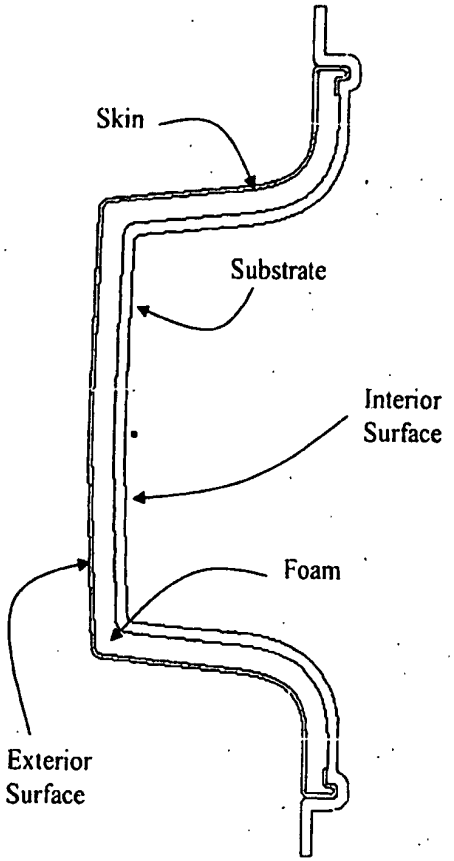


FIGURE 38

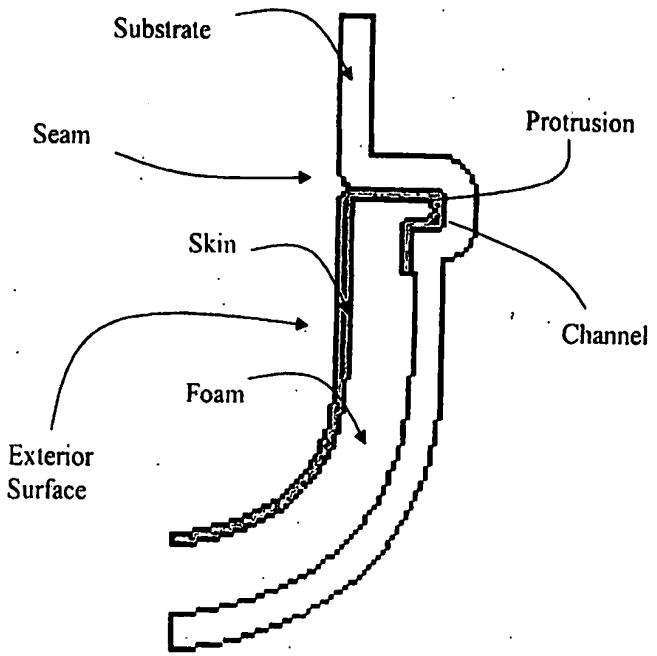
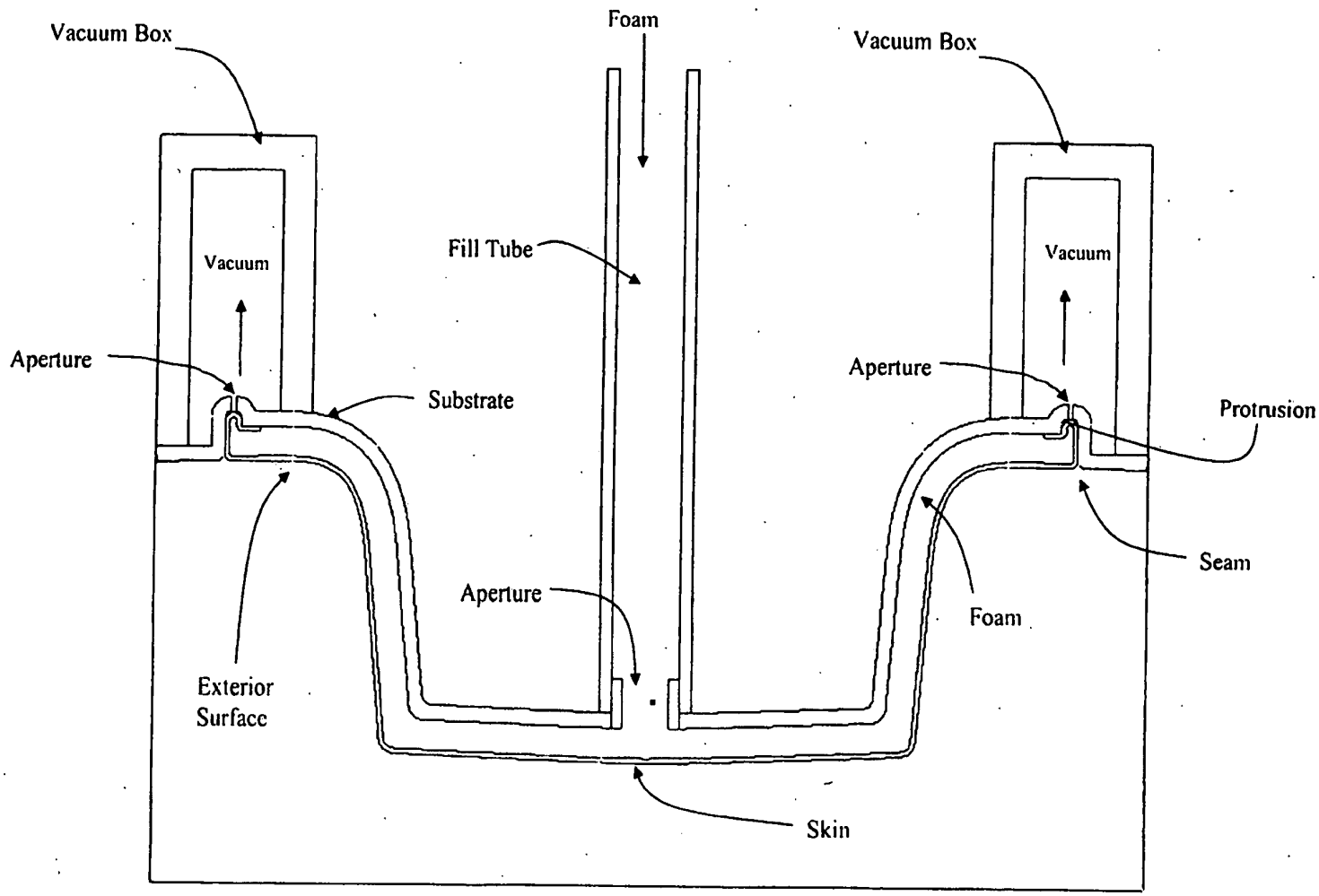


FIGURE 39

FIGURE 40


Vacuum Box
Foam
Vacuum Box
Vacuum
Fill Tube
Vacuum
Aperture
Substrate
Aperture
Protrusion
Aperture
Seam
Foam
Exterior
Surface
Skin

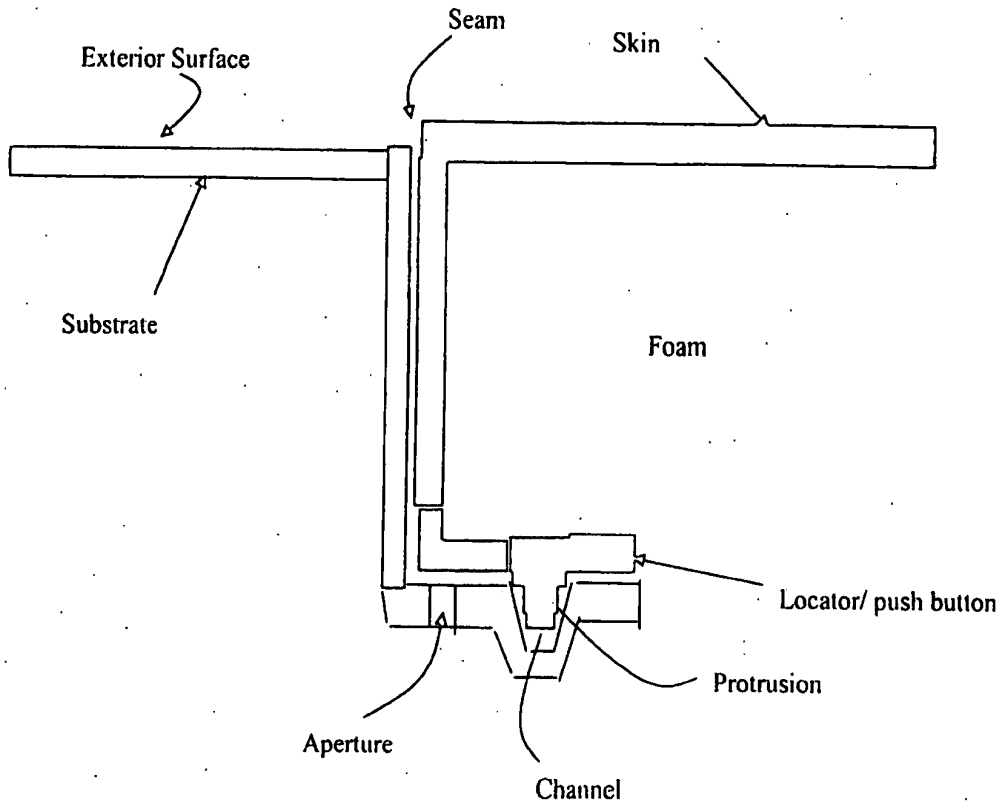
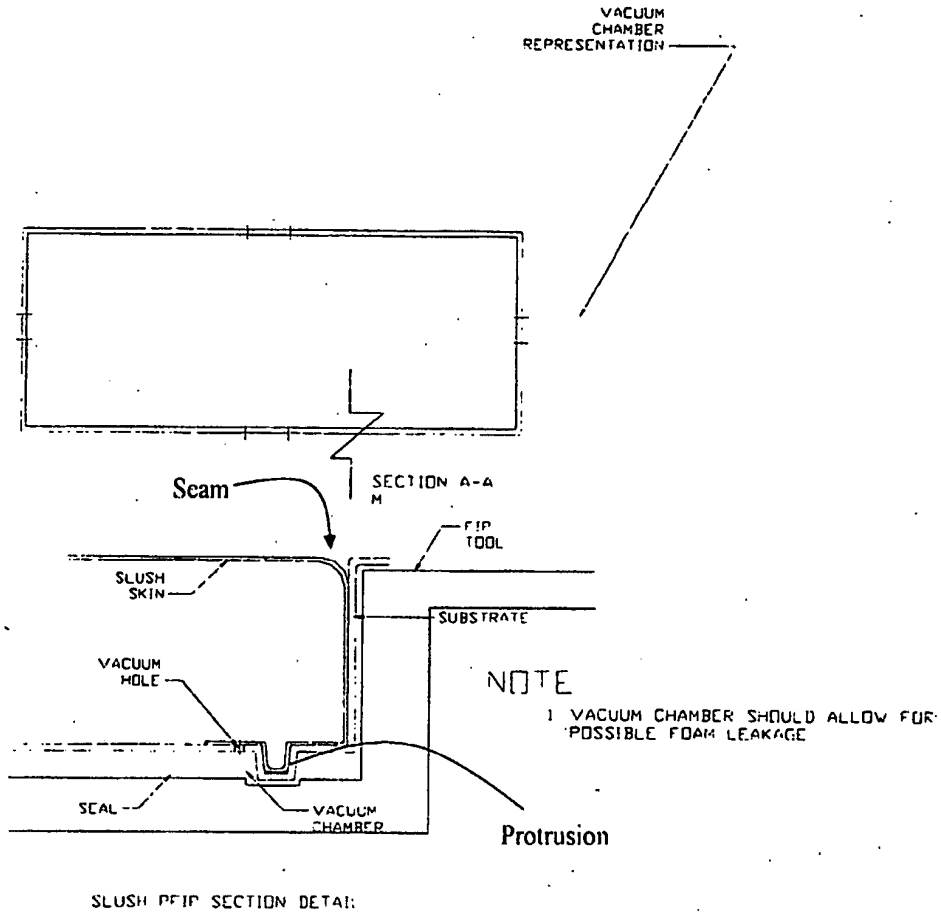

Seam
Exterior Surface
Skin
Substrate
Foam
Locator/ push button
Protrusion
Aperture
Channel

FIGURE 41

FIGURE 42



SLUSH PFIP SECTION DETAIL

FIGURE 43

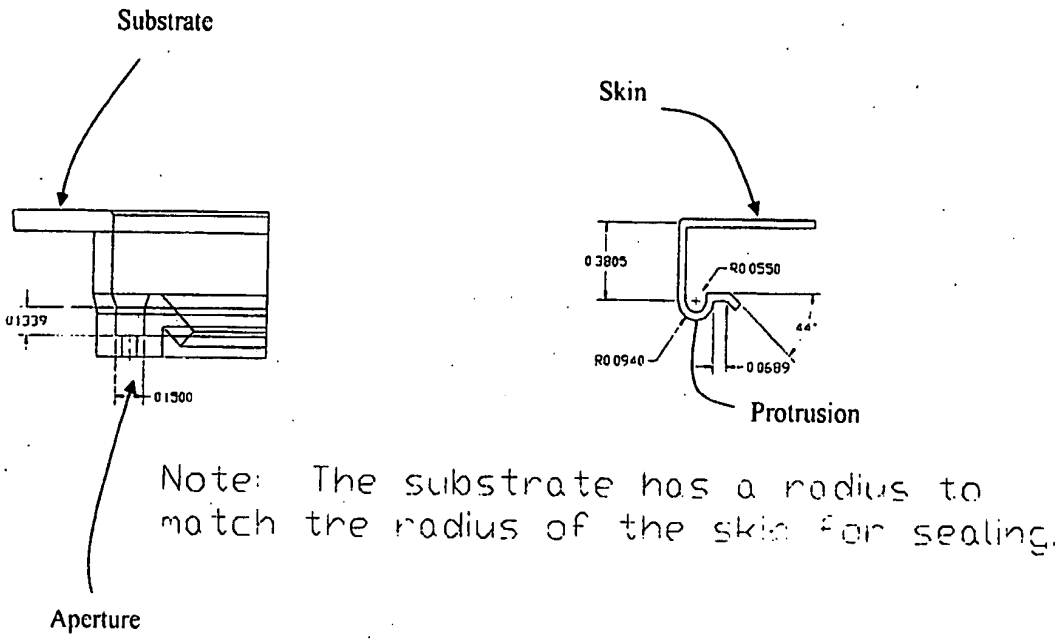
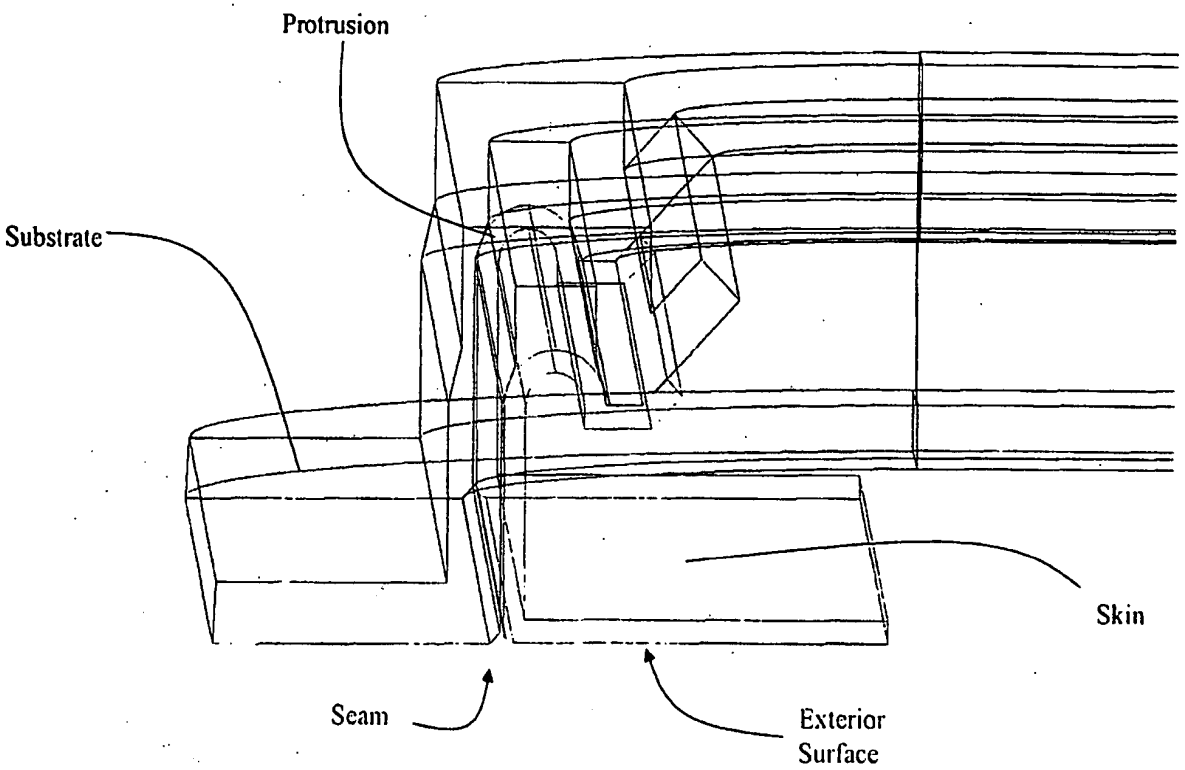

Substrate
Skin
0.3805
R0.0550
44°
R0.0940
0.0689
Protrusion
0.1339
0.1500
Aperture
Note: The substrate has a radius to match the radius of the skin for sealing.

FIGURE 44



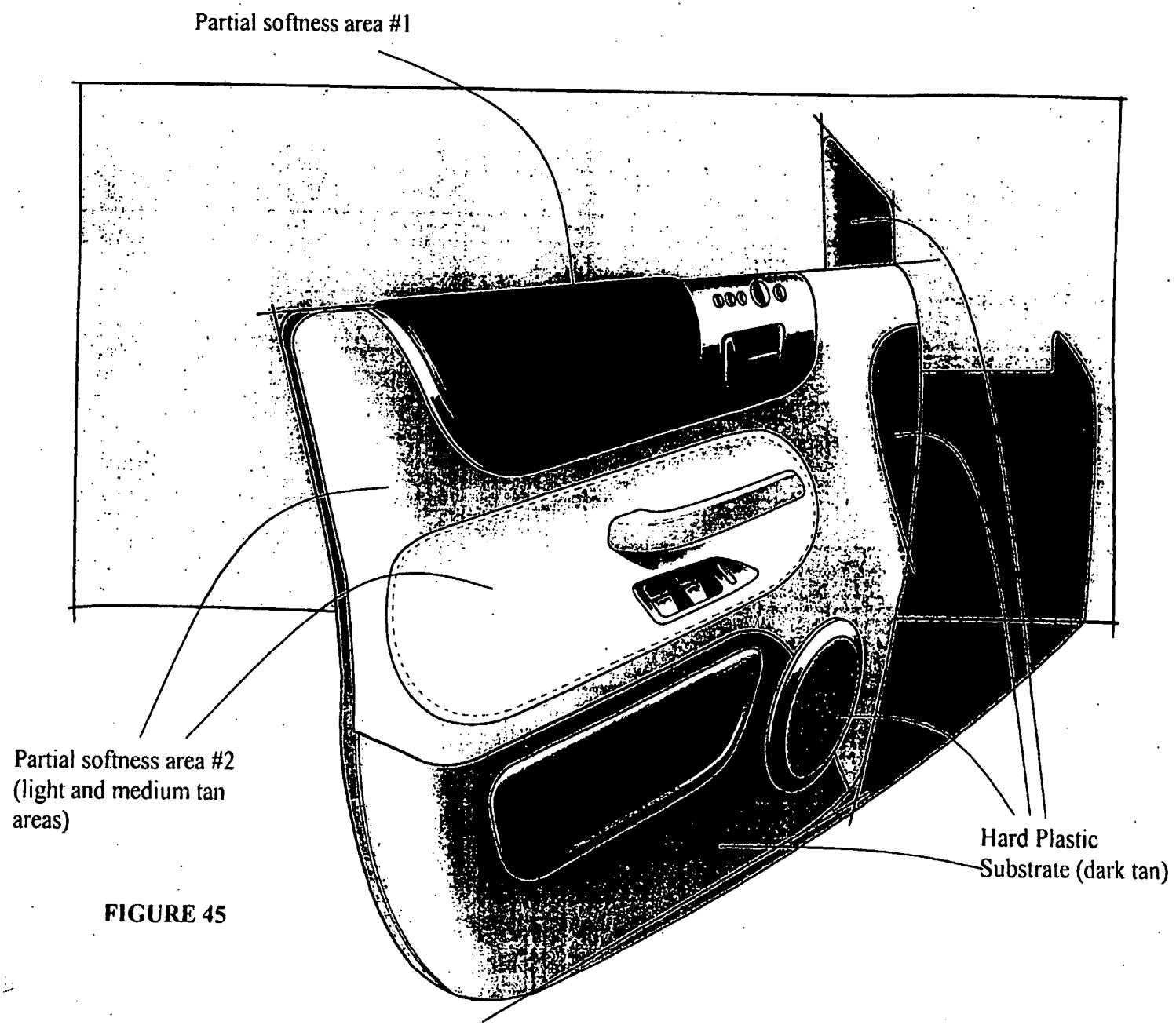

Partial softness area #1
Partial softness area #2
(light and medium tan
areas)
Hard Plastic
Substrate (dark tan)

FIGURE 45

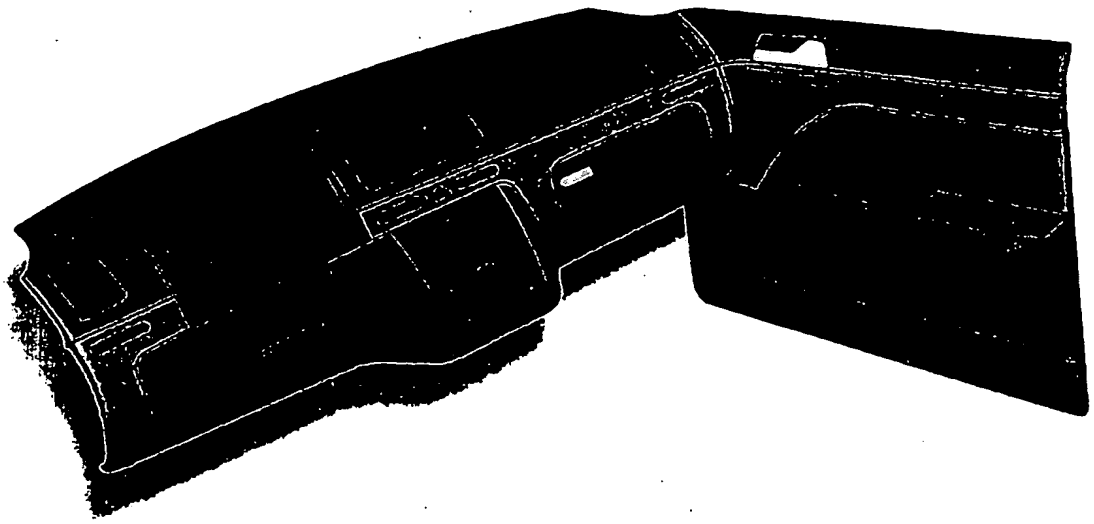


Figure 46

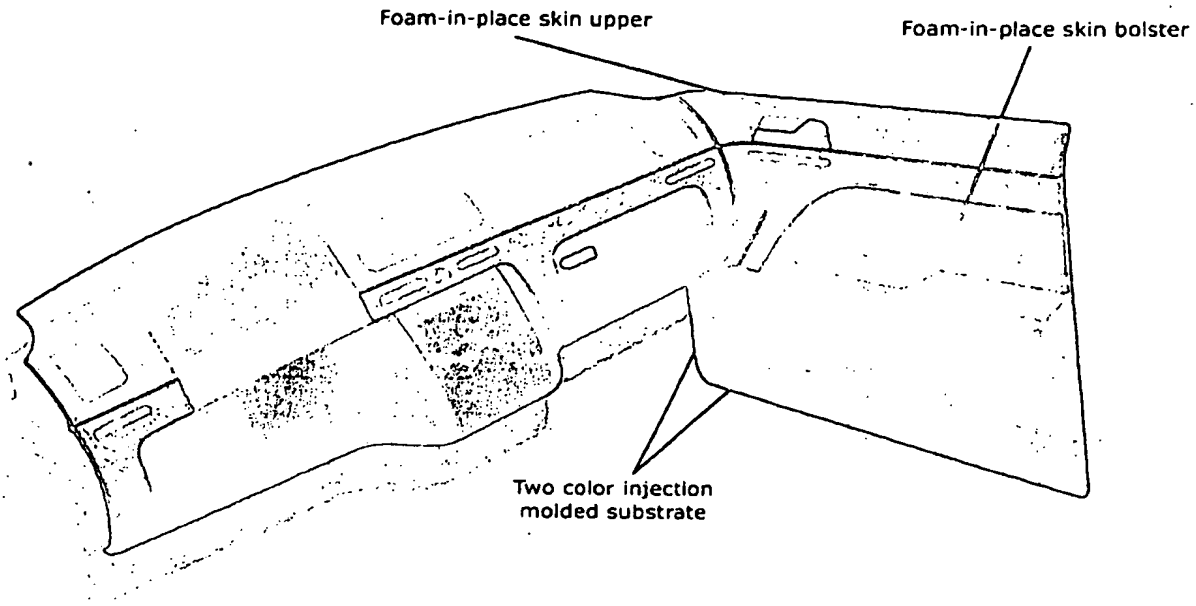

Foam-in-place skin upper
Foam-in-place skin bolster
Two color injection
molded substrate

Figure 47

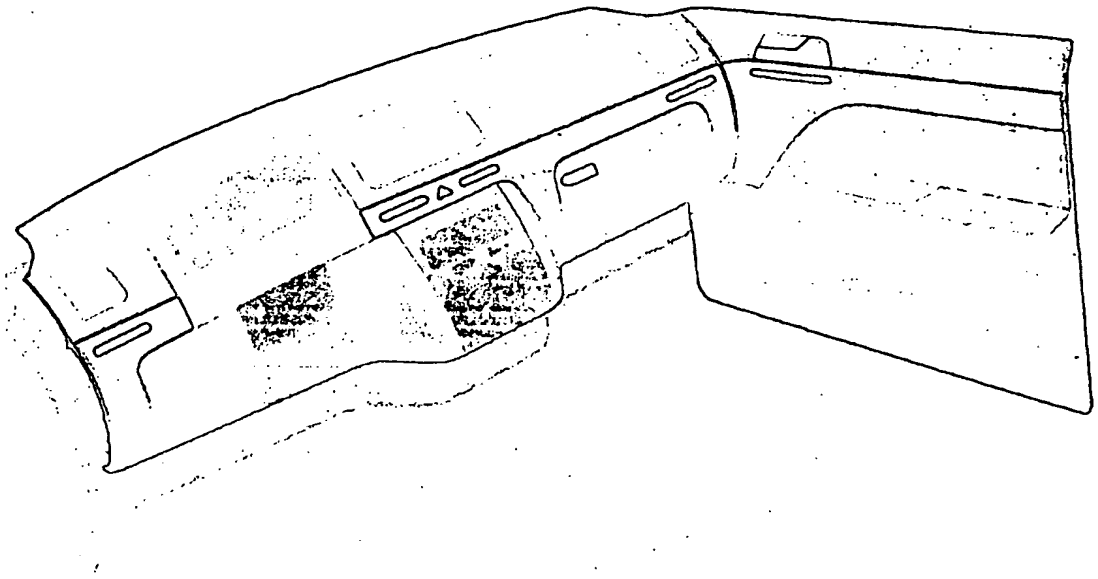


Figure 48

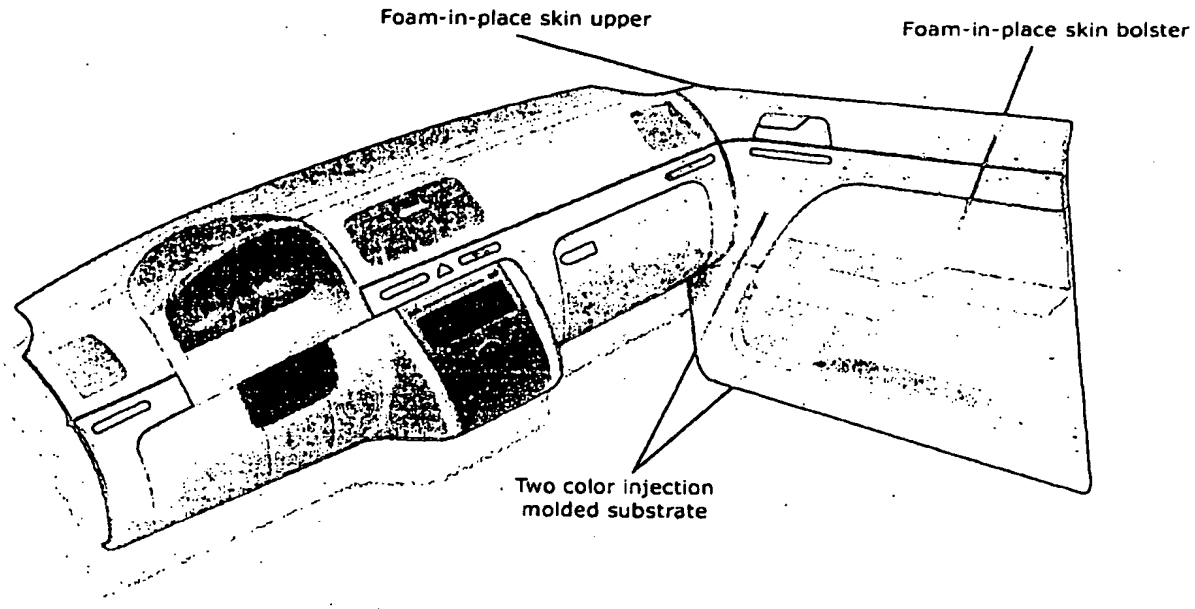

Foam-in-place skin upper
Foam-in-place skin bolster
Two color injection
molded substrate

Figure 49

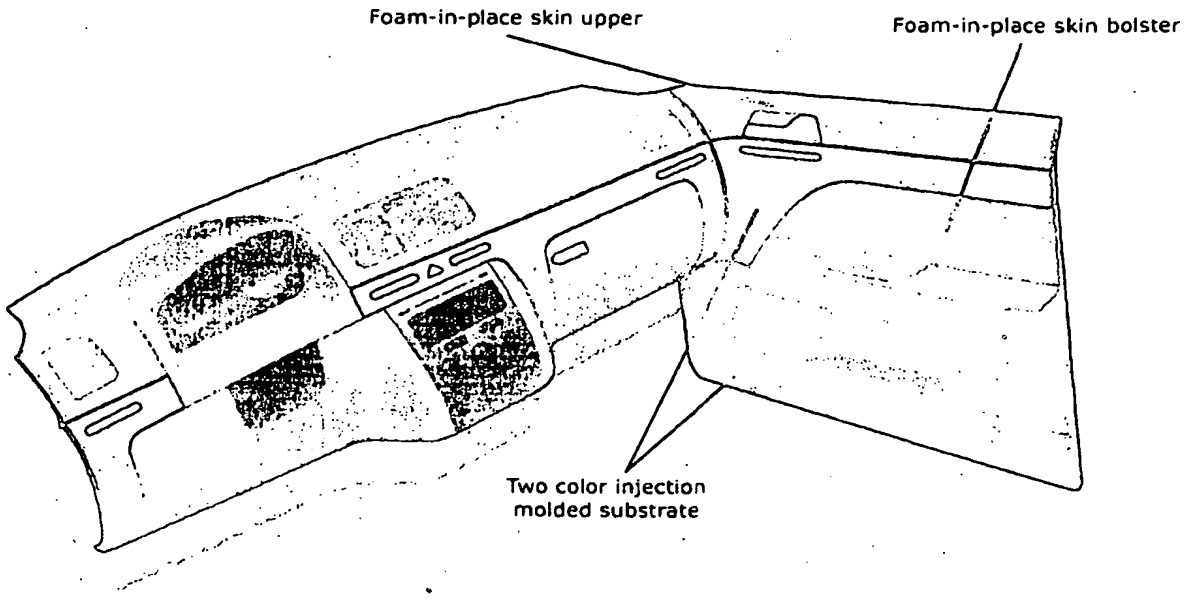

Foam-in-place skin upper
Foam-in-place skin bolster
Two color injection
molded substrate

Figure 50

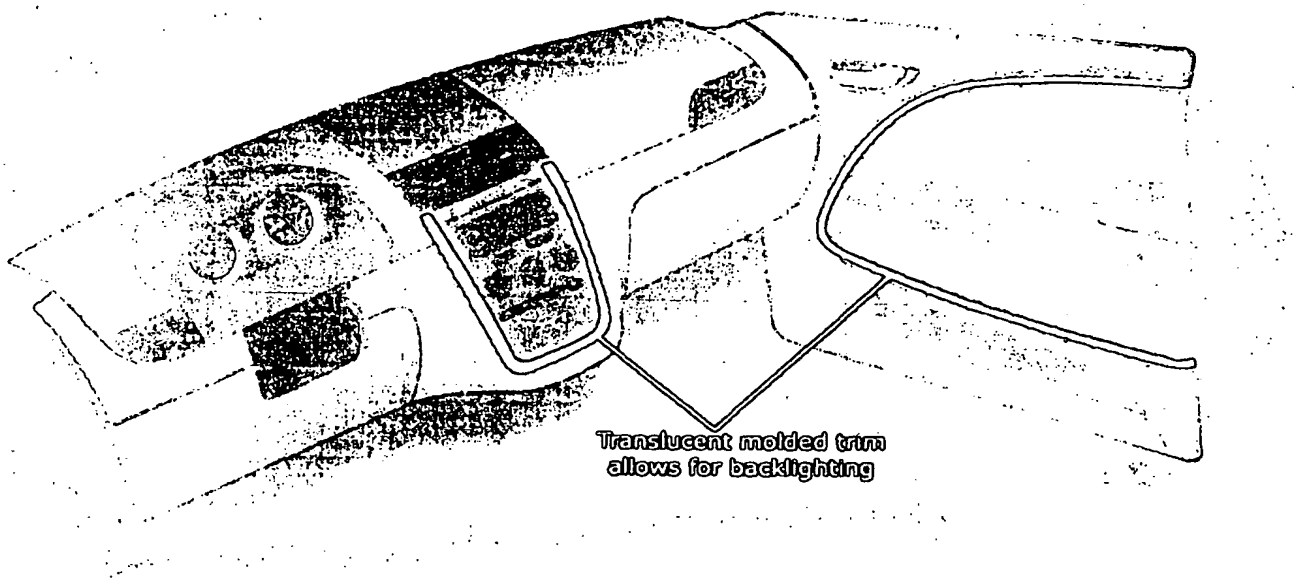


Figure 51

Application Data Sheet

Application Information

Application Type::	Provisional
Subject Matter::	Utility
Suggested classification::	
Suggested Group Art Unit::	
CD-ROM or CD-R?::	None
Computer Readable Form (CRF)?::	No
Title::	VEHICLE COMPONENT AND METHOD FOR MAKING A VEHICLE COMPONENT
Attorney Docket Number::	026032-4654 (PFIP)
Request for Early Publication?::	No
Request for Non-Publication?::	No
Suggested Drawing Figure::	47
Total Drawing Sheets::	30
Small Entity?::	No
Petition included?::	No
Secrecy Order in Parent Appl.?::	No

Applicant Information

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Nels R.
Family Name::	Smith
City of Residence::	Zeeland

State or Province of Residence::	MI
Country of Residence::	US
Street of mailing address::	10230 Springwood Drive
City of mailing address::	Zeeland
State or Province of mailing address::	MI
Postal or Zip Code of mailing address::	49464

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Scott A.
Family Name::	Hansen
City of Residence::	Holland
State or Province of Residence::	MI
Country of Residence::	US
Street of mailing address::	447 Pinewood Court
City of mailing address::	Holland
State or Province of mailing address::	MI
Postal or Zip Code of mailing address::	49424

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Jeffrey T.
Family Name::	Stout

City of Residence::	Grand Rapids
State or Province of Residence::	MI
Country of Residence::	US
Street of mailing address::	2050 Francis Avenue SE
City of mailing address::	Grand Rapids
State or Province of mailing address::	MI
Postal or Zip Code of mailing address::	49507

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Andrew R.
Family Name::	Butz
City of Residence::	Zeeland
State or Province of Residence::	MI
Country of Residence::	US
Street of mailing address::	2916 - 104th Avenue
City of mailing address::	Zeeland
State or Province of mailing address::	MI
Postal or Zip Code of mailing address::	49464

Applicant Authority Type::	Inventor
Primary Citizenship Country::	US
Status::	Full Capacity
Given Name::	Bart W.

Family Name::	Fox
City of Residence::	Zeeland
State or Province of Residence::	MI
Country of Residence::	US
Street of mailing address::	4654 Majestic Vue
City of mailing address::	Zeeland
State or Province of mailing address::	MI
Postal or Zip Code of mailing address::	49464

Correspondence Information

Correspondence Customer Number::	26371
E-Mail address::	PTOMailMilwaukee@Foley.com

Representative Information

Representative Customer Number::	26371	

Domestic Priority Information

Application::	**Continuity Type::**	**Parent Application::**	**Parent Filing Date::**

Foreign Priority Information

Country::	Application number::	Filing Date::	Priority Claimed::

Assignee Information

Assignee name:: Johnson Controls Technology Company

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

GUSTAFSON, Adam, M.
FOLEY & LARDNER LLP
777 East Wisconsin Avenue
Milwaukee, WI 53202
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)* 09 March 2005 (09.03.2005)	
Applicant's or agent's file reference 027830-5105	**IMPORTANT NOTIFICATION**
International application No. PCT/US05/000038	International filing date *(day/month/year)* 03 January 2005 (03.01.2005)
International publication date *(day/month/year)*	Priority date *(day/month/year)* 03 January 2004 (03.01.2004)
Applicant JOHNSON CONTROLS TECHNOLOGY COMPANY et al	

1. By means of this Form, which replaces any previously issued notification concerning submission or transmittal of priority documents, the applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to all earlier application(s) whose priority is claimed. Unless otherwise indicated by the letters "NR", in the right-hand column or by an asterisk appearing next to a date of receipt, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).

2. *(If applicable)* The **letters "NR"** appearing in the right-hand column denote **a priority document which, on the date of mailing of this Form, had not yet been received by the International Bureau** under Rule 17.1(a) or (b). Where, under Rule 17.1(a), the priority document must be submitted by the applicant to the receiving Office or the International Bureau, but the applicant fails to submit the priority document within the applicable time limit under that Rule, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

3. *(If applicable)* **An asterisk (*)** appearing next to a date of receipt, in the right-hand column, denotes **a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b)** (the priority document was received after the time limit prescribed in Rule 17.1(a) or the request to prepare and transmit the priority document was submitted to the receiving Office after the applicable time limit under Rule 17.1(b)). Even though the priority document was not furnished in compliance with Rule 17.1(a) or (b), the International Bureau will nevertheless transmit a copy of the document to the designated Offices, for their consideration. In case such a copy is not accepted by the designated Office as the priority document, Rule 17.1(c) provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

Priority date	Priority application No.	Country or regional Office or PCT receiving Office	Date of receipt of priority document
03 January 2004 (03.01.2004)	60/534,321	US	09 February 2005 (09.02.2005)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 740 14 35

Authorized officer

Garcia-Conde Rodrigo

Facsimile No. +41 22 338 89 65
Telephone No. +41 22 338 9928